

AMERICAN JOURNAL OF OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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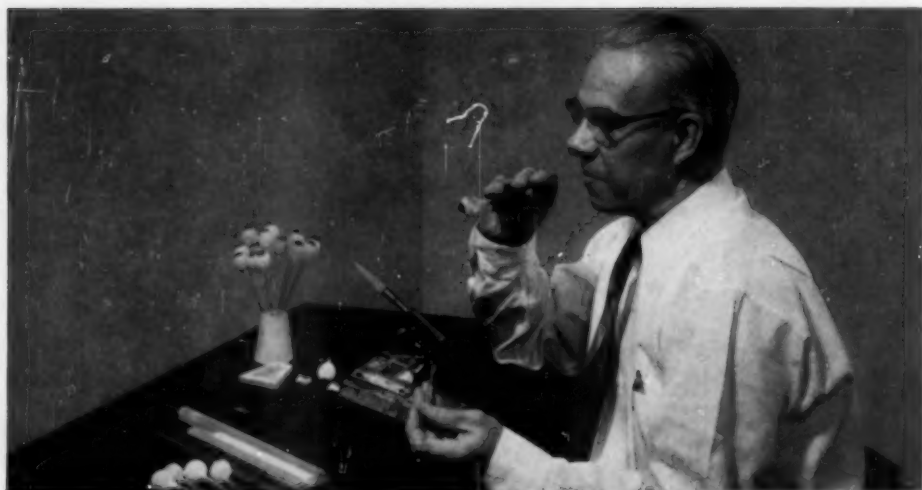
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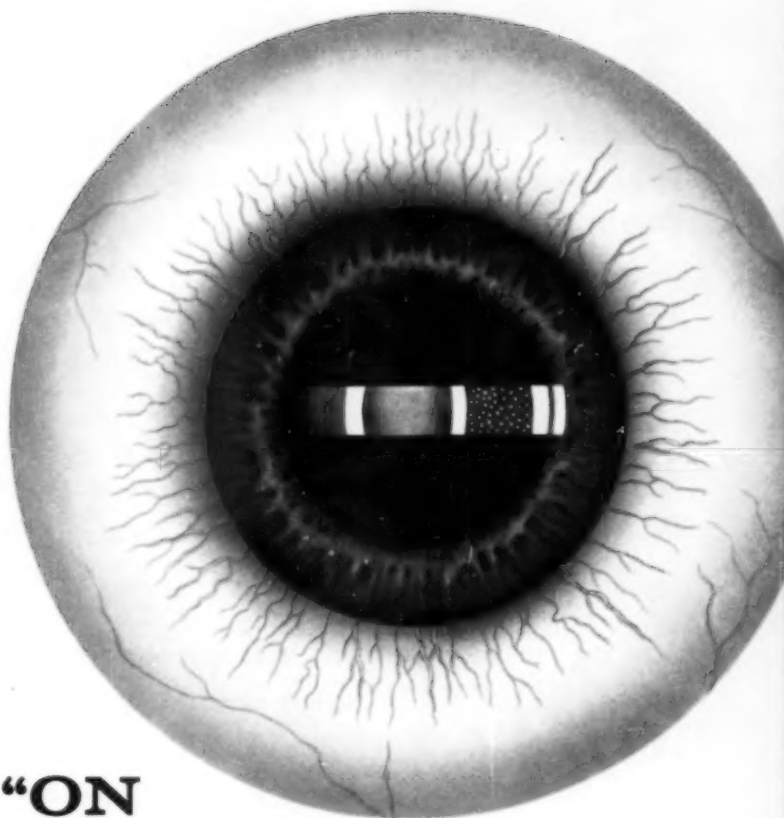
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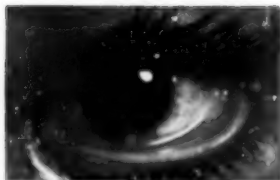
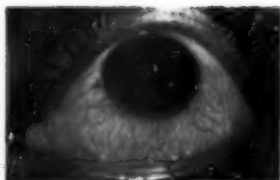
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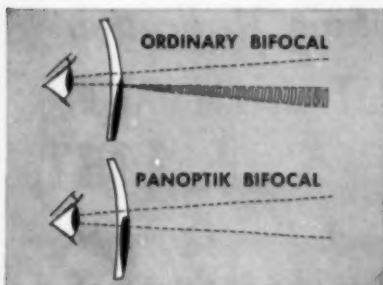
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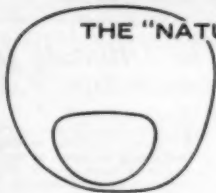


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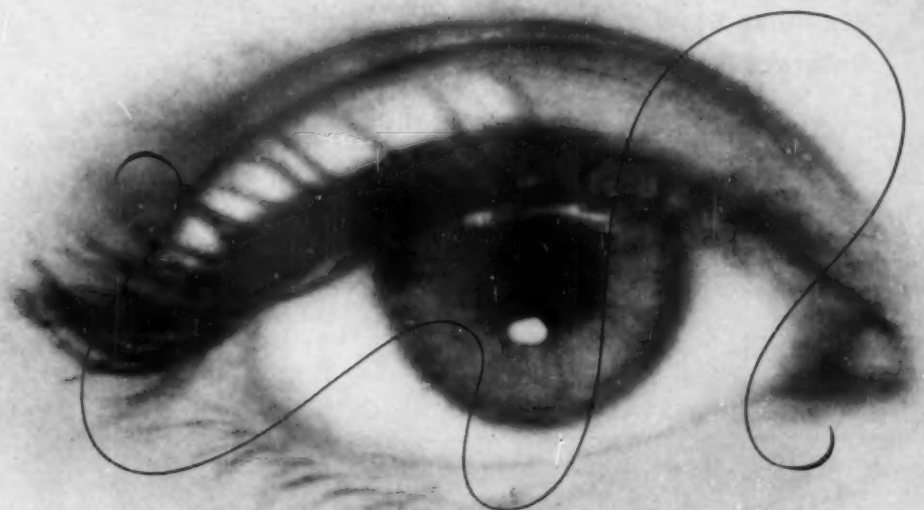
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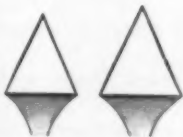
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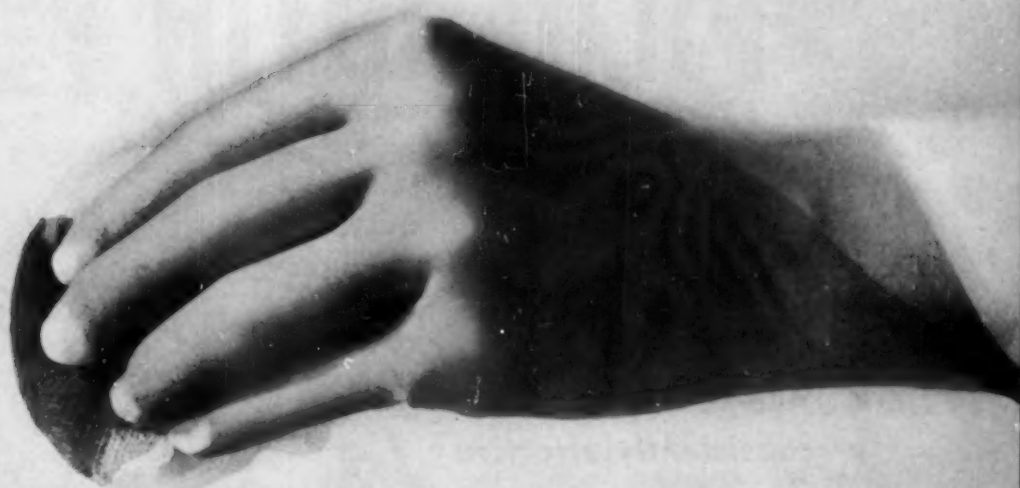
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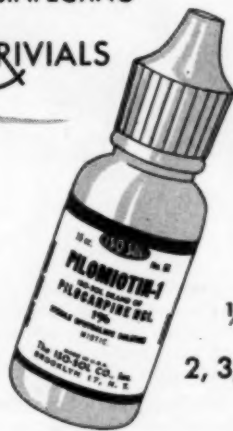
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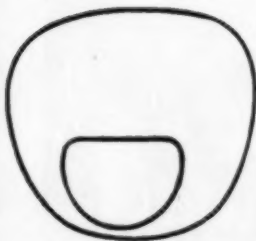


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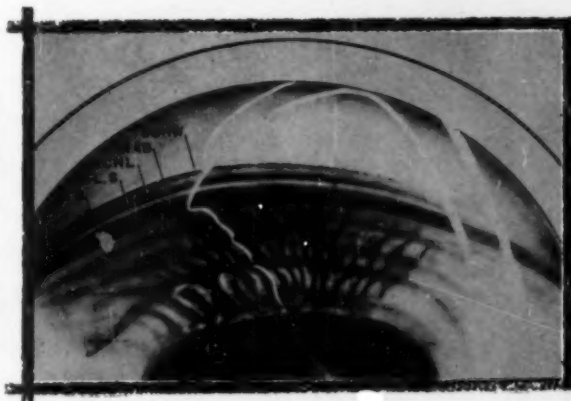


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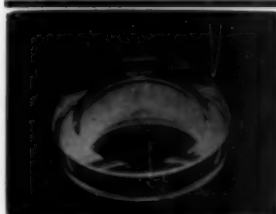
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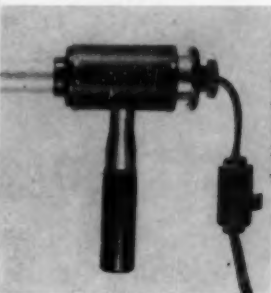
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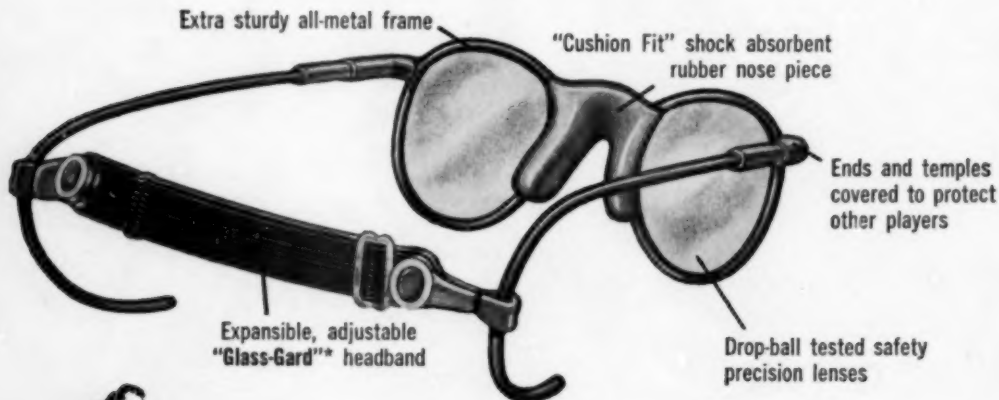
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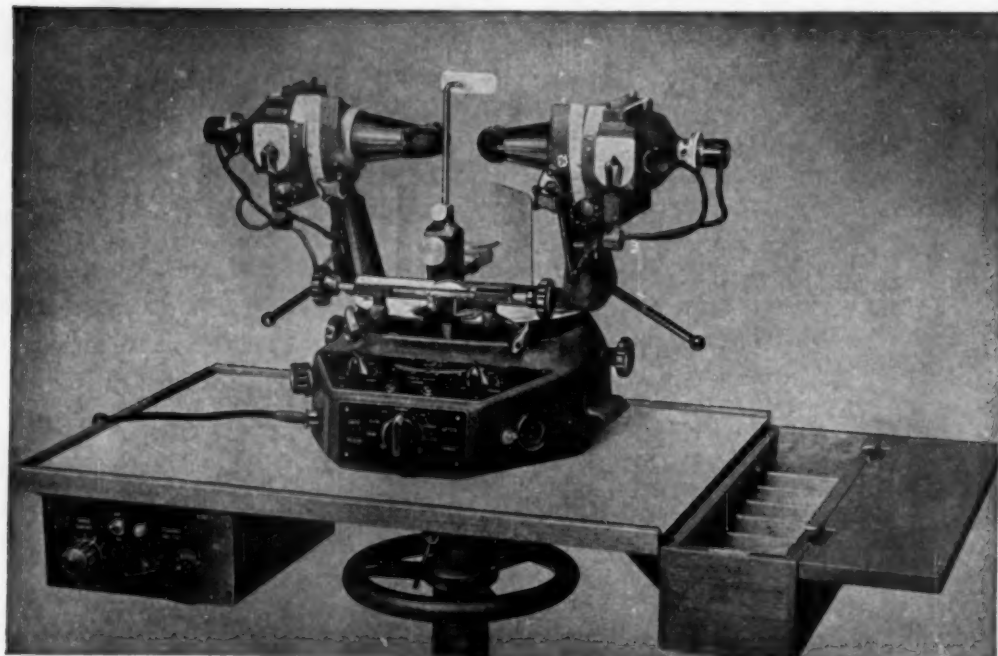
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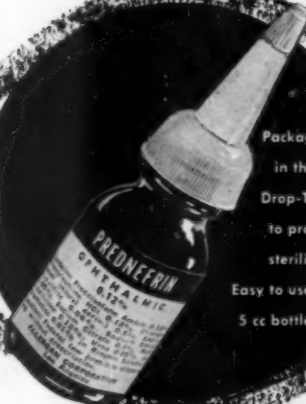
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1. *Cecil's Textbook of Medicine*, 7th ed., 1947, p. 1287.
2. *Ibid.*, p. 1598.
3. *Am. J. Ophth.* 42:771, 1956.
4. *Am. J. Digest. Dis.* 22:5, 1955.
5. *Med. Times* 84:741, 1956.

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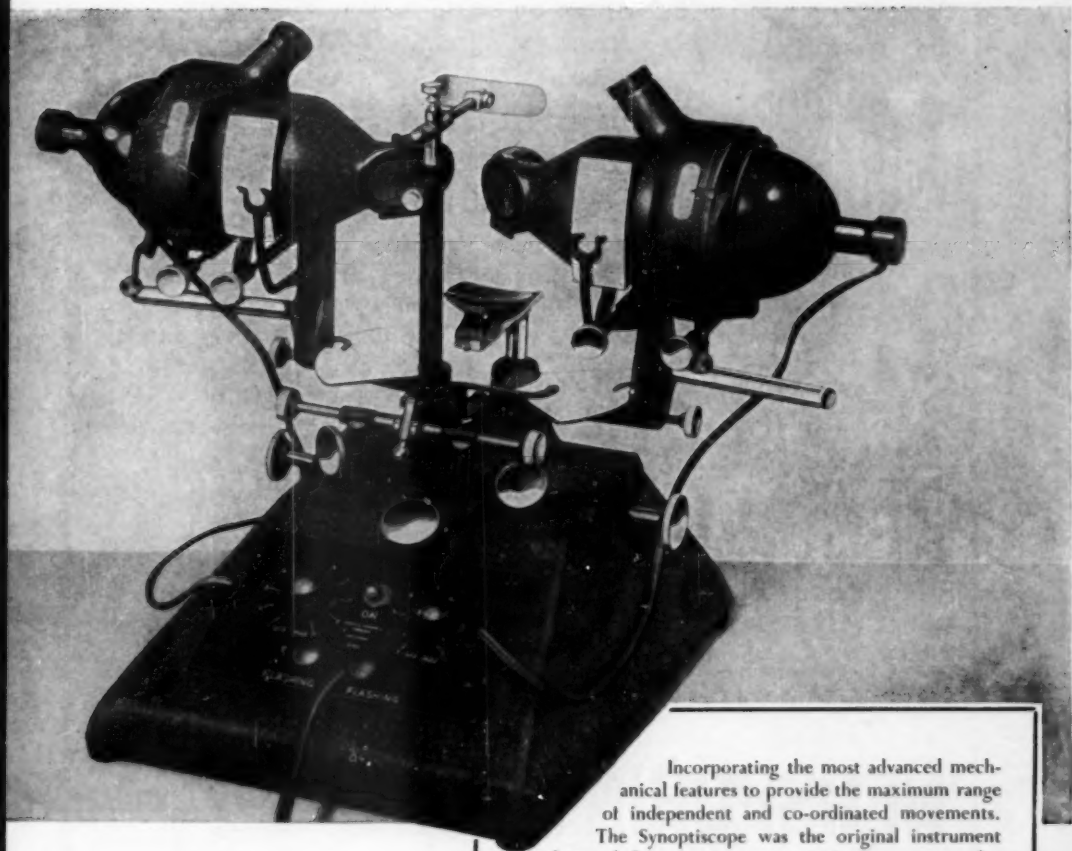
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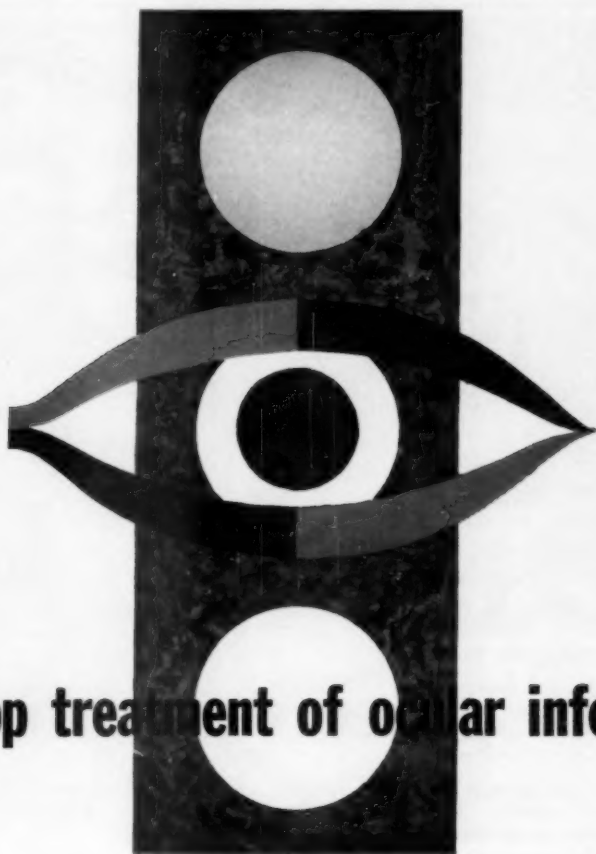
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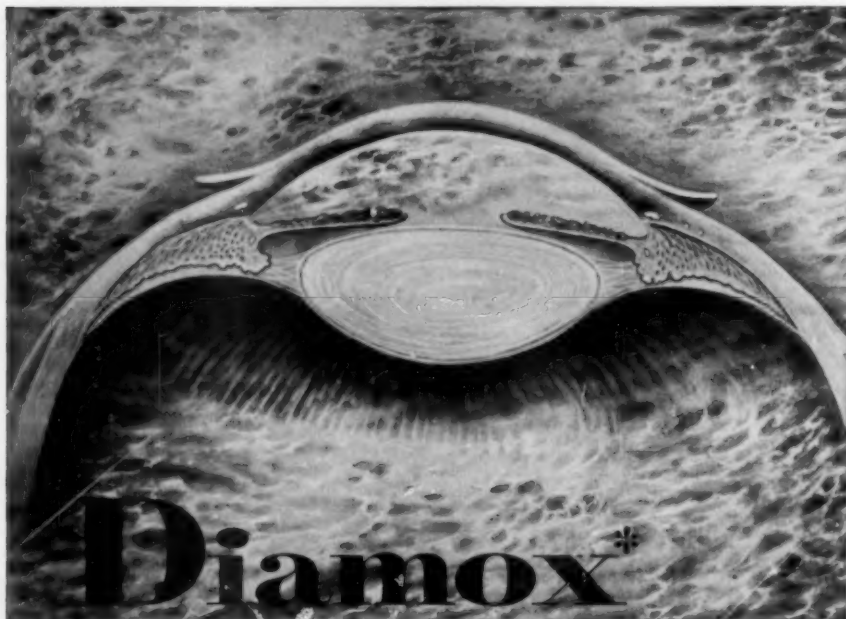
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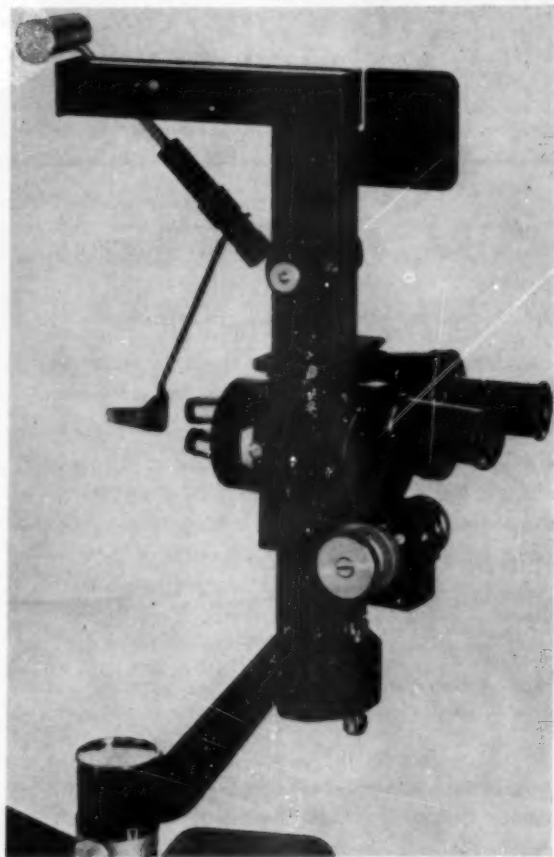
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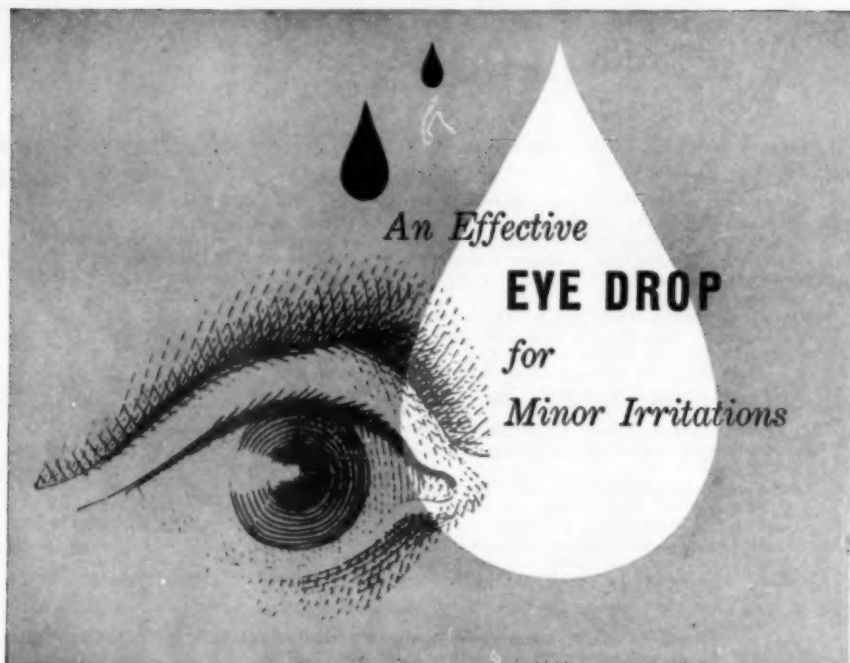
The lenses were checked for power, axis and possible lens flaws and found to be correct and free from aberrations. The trouble was found to lie in the patient's facial asymmetry. The pupillary center of each lens was dotted, using white ink and a marking stick. The dots disclosed that the left eye was four millimeters farther from the center of the nose than the right eye. Whoever made the glasses had decentered each segment in two millimeters with the result that the patient was looking through the center of one segment and through the outer edge of the other. Naturally he was unable to read comfortably.

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GRANULAR DYSTROPHY OF THE CORNEA*

A HISTOPATHOLOGIC STUDY OF A CASE

J. REIMER WOLTER, M.D., AND WILLIAM M. CUTLER, M.D.

Ann Arbor, Michigan

According to Buecklers,^{1,2} granular or crumblike dystrophy is the most common of the hereditary corneal dystrophies. Previous to Buecklers' classification this clinical entity has been classified as Groenouw's nodular dystrophy (Groenouw,^{3,4} Duke-Elder⁵), or as Fleischer's familial corneal dystrophy type II (Fleischer⁶). Franceschetti and Babel⁷ called the same condition the nodular type of the noncongenital progressive corneal dystrophies.

Granular dystrophy is one of the hereditary corneal dystrophies which are not present at birth but occur during the first decades of life. The disease is always bilateral, avascular, and progressive. A dominant type of hereditary transmission is characteristic (Thomas⁸).

This study represents a histopathologic demonstration of a typical case of granular corneal dystrophy. A new staining technique was used which makes it possible to demonstrate the changes of the corneal lamellae and membranes as well as of the corneal cells and nerves in this condition.

CASE HISTORY

The patient, a 39-year-old Negress, complained of painless progressive loss of vision in both eyes for 12 years. Intermittent headaches and photophobia were present. She was unable to read for the past three years. Of nine siblings, seven had no history of ocular difficulty but two brothers were reported

to have similar trouble beginning at the ages of 24 and 28 years, and were told that they have the same condition as the patient. There was no other family history of eye disease.

The patient's vision when first seen was finger counting in both eyes. Both corneas were similarly involved with raised whitish nodules predominantly in the anterior stroma and Bowman's membrane area giving the epithelium an irregular appearance but no corneal staining was elicited with two-percent fluorescein. In addition, there were a few whitish nodules in the deeper corneal stroma. These changes were most marked centrally and there was diffuse clouding between the nodules in the central cornea. Toward the periphery and within two mm. of the limbus there was slight cloudiness but no nodules. There were occasional Hudson-Stahli lines. No corneal edema was evident. Other than these corneal changes, with resulting inability to visualize the fundus, the ophthalmologic examination was normal.

A penetrating eight-mm. keratoplasty was performed under local anesthesia on the left eye. Eight sutures of 6-0 black silk were placed directly across the incision. These were removed on the 15th postoperative day. There were no postoperative complications. Visual acuity was correctable to 20/25, J0.

Three months after surgery ocular tension was found to be 31 mm. Hg with a 5.5-gm. weight (Schiotz). There was normal scleral rigidity. Visual fields were normal. Gonioscopy showed a deep anterior chamber with a wide open angle. However, there was a moderate amount of pigment with some clumps on the trabecula. The facility of outflow by tonography was 0.10. The tension in the unoperated right eye was 14.7 mm. Hg and the facility of outflow was 0.15. The tension in the left eye was adequately controlled in the range of 14.7 mm. Hg by the use of pilocarpine (two percent) four times daily.

Five months after the first keratoplasty a similar procedure was performed on the right eye. At the present time both donor grafts appear clear and there have been no other complications.

MATERIAL AND METHOD

The corneal button from the right eye was

*From the Laboratory of Neuropathology and Neuro-ophthalmology and from the Department of Ophthalmology of the University of Michigan Hospital, Ann Arbor. Supported by Grant No. B-475-C3 of the United States Department of Public Health, Education, and Welfare.

fixed in bromformalin (Cajal solution) immediately after its removal. It measured eight mm. in diameter. Flat sections of this button were cut on the freezing microtome. These sections were impregnated with the panoptic silver carbonate method of del Rio Hortega. The advantage of this method is that it stains the cellular elements and nerves of the cornea as well as the corneal lamellae and membranes.⁸⁻¹¹ A detailed description of the technique and results of this method has been published by Scharenberg and Zeman.¹²

All the illustrations represent unretouched photomicrographs.

HISTOPATHOLOGIC DESCRIPTION

The epithelium of the corneal button was continuous, but it was very irregular in thickness. Nodular masses of hyaline substance were found to protrude from the stroma into the epithelial layer, and the epithelium was reduced to a thin layer of flattened cells on the surface of these hyaline masses (figs. 1 to 4). This epithelial thinning on top of the hyaline nodules was in contrast to an increase of thickness of the epi-



Fig. 1 (Wolter and Cutler). Flat section through the epithelium of the corneal button of the patient with granular dystrophy, exhibiting a large homogeneous hyaline body which protrudes into the epithelial layer (arrow). (Hortega method, photomicrograph, $\times 50$).



Fig. 2 (Wolter and Cutler). Polymorph, crumb-like formations of hyaline protruding into the epithelial layer (arrow) of the case of granular dystrophy. (Flat section, Hortega method, photomicrograph, $\times 50$.)

thelium between them.

Bowman's membrane could not be demonstrated in the areas of the subepithelial hyaline masses. But parts of this membrane were visible at some places between the hyaline bodies. The nerve fibers which supply

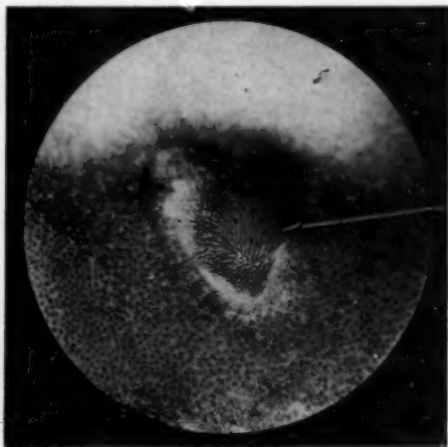


Fig. 3 (Wolter and Cutler). Hyaline body of the epithelium of the corneal button of the present case with granular dystrophy which exhibits a peculiar striation (arrow). (Flat section, Hortega method, photomicrograph, $\times 50$.)

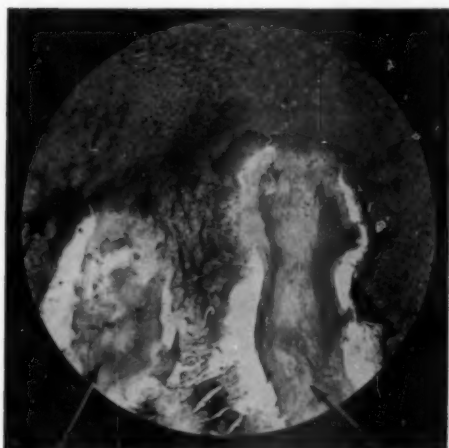


Fig. 4 (Wolter and Cutler). Two large hyaline bodies of the epithelium of the cornea with granular dystrophy. These bodies exhibit an onionlike, lamellar structure (arrow). (Flat section, Hortege method, photomicrograph, $\times 50$.)

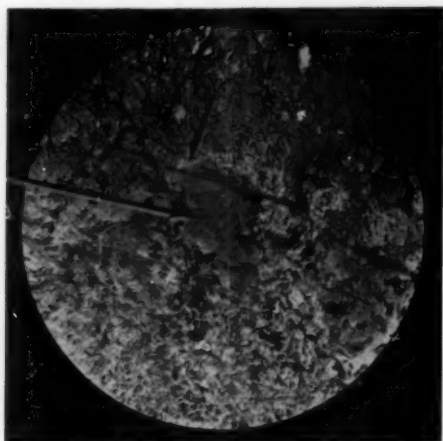


Fig. 5 (Wolter and Cutler). Small accumulation of hyaline (arrow) in the space of the atrophic membrane of Bowman of the cornea with granular dystrophy. (Flat section, Hortege method, photomicrograph, $\times 50$.)

the basal layer of the epithelium and form the basal epithelial plexus could be demonstrated only in those areas without hyaline accumulation (fig. 6). No nerves were found

in the flattened epithelium on top of the hyaline bodies.

The hyaline bodies which had replaced parts of Bowman's membrane and pro-

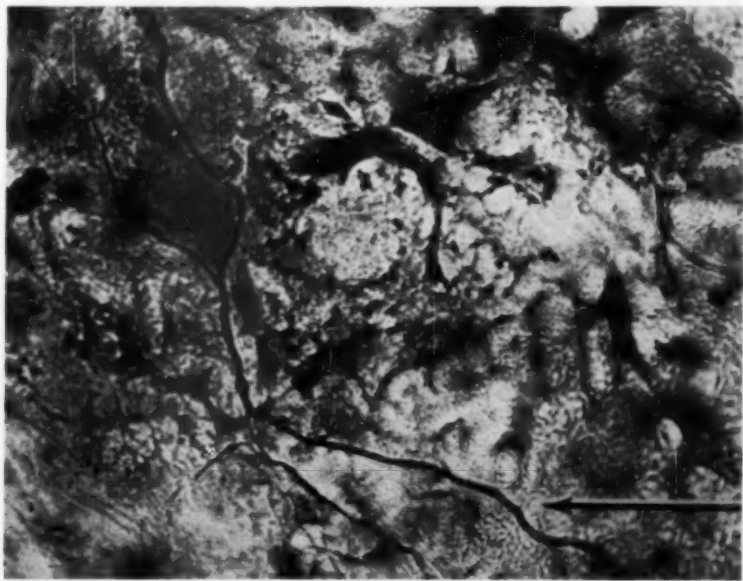


Fig. 6 (Wolter and Cutler). High-power view of nerve fibers (arrow) in the basal epithelium of the cornea with granular dystrophy. (Flat section, Hortege method, photomicrograph, $\times 1,000$.)

truded into the epithelial layer were very irregular in shape. The structure of most of these bodies was homogeneous (fig. 1). Others represented polymorphic, crumblike formations which contained an exudatelike fluid in their spaces (fig. 2). In some others of these bodies a peculiar pattern of delicate striation was histologically visible (fig. 3). The large hyaline bodies often showed a lamellar onionlike architecture (fig. 4). Small accumulations of hyaline were seen in the space of the atrophic membrane of Bowman in addition to the large hyaline bodies (fig. 5).

The hyaline bodies of the subepithelial space were directly continuous with large irregular patches of hyaline of the superficial stroma. It was clearly visible in the flat sections of the corneal button that these patches in the superficial stroma represented areas of hyalinized corneal lamellae. These lamellae still had their normal horizontal arrangement and interwoven pattern. But they had lost

their fibrillar structures and were homogeneously hyalinized and swollen. This patchlike hyalinization was found only in the superficial stroma. The corneal lamellae were virtually normal in the deeper stroma.

Very advanced pathologic changes of the stroma cells (corneal corpuscles) were an outstanding finding in the superficial stroma of this specimen. The stroma cells normally represent flat cells which occupy the spaces of the flat interlacing corneal lamellae. These cells have an oval nucleus and long interconnected processes. Figures 7 and 8 represent stroma cells of the normal human cornea and demonstrate the pattern of this intricate syncytial cell system as seen in a flat section after silver carbonate impregnation. Figures 9 and 10 represent stroma cells of the most superficial stroma in this case of granular corneal dystrophy. These cells have lost their processes and their normal arrangement. They are piled up in groups and the hyalinized corneal lamellae which surround these

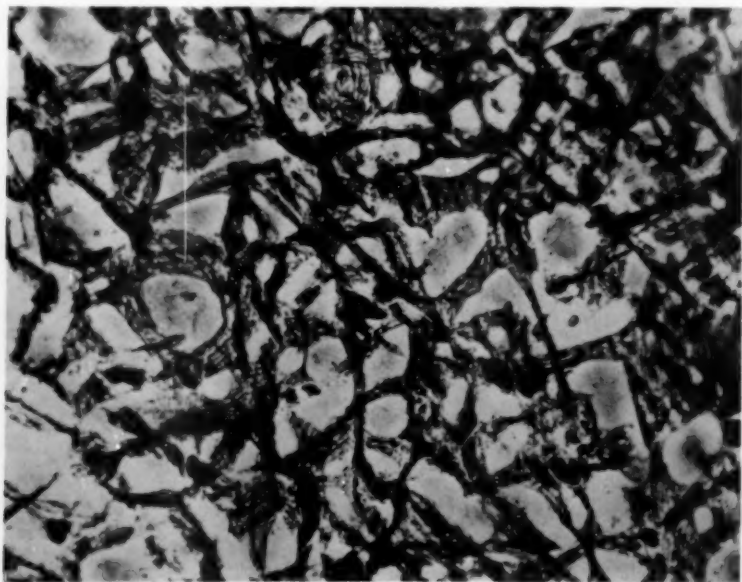


Fig. 7 (Wolter and Cutler). Interconnected system of stromal cells (corneal corpuscles) of a normal human cornea. The cell bodies are clearly visible. The corneal lamellae are not stained and are contained within the "empty" spaces between the stromal cells in the picture. (Flat section, Hortege method, photomicrograph, $\times 200$.)

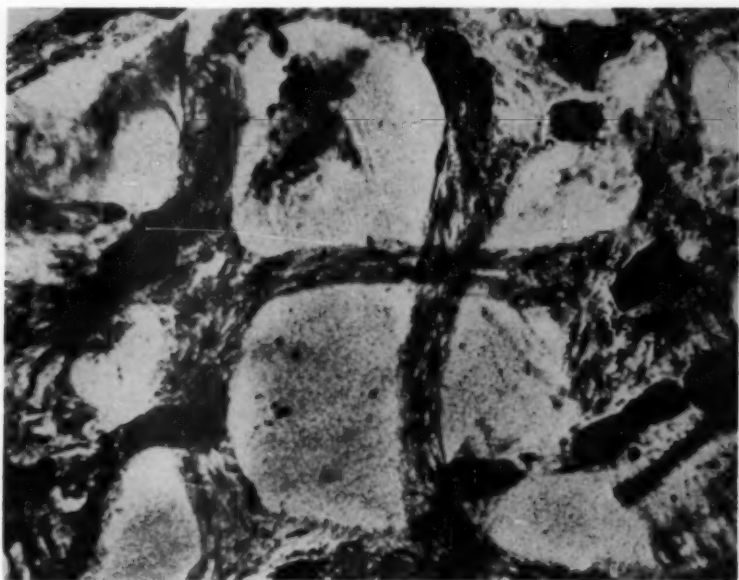


Fig. 8 (Wolter and Cutler). High-power view of stromal cells of the normal human cornea with their interconnected processes. The oval nuclei are clearly visible within the cellular protoplasm. (Flat section, Hortega method, photomicrograph, $\times 800$.)

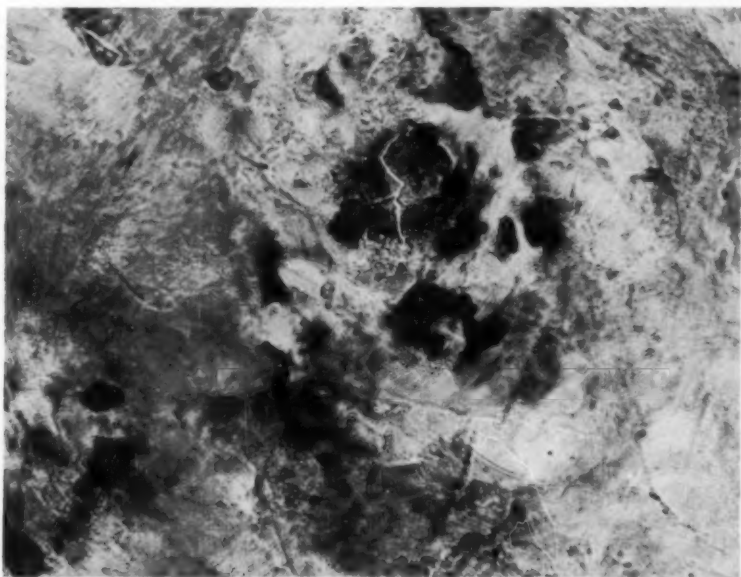


Fig. 9 (Wolter and Cutler). Small group of degenerated stromal cells in the superficial stroma of the present case of granular dystrophy. The surrounding corneal lamellae are hyalinized. (Flat section, Hortega method, photomicrograph, $\times 600$.)

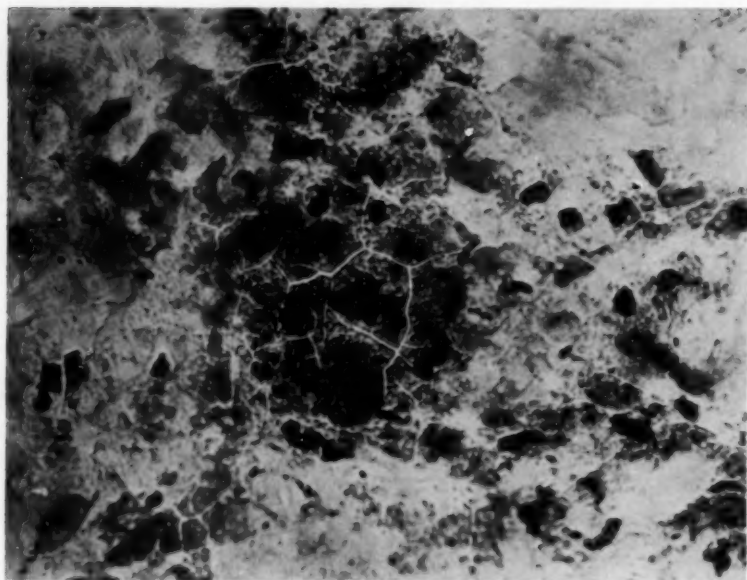


Fig. 10 (Wolter and Cutler). Nestlike group of stromal cells in the hyalinized superficial stroma of the case with granular dystrophy. Some of the cells exhibit an epithelioid shape. Others are destroyed and only their pyknotic nuclei remain in the tissue. (Flat section, Hortege method, photomicrograph, $\times 600$.)

groups contain no stroma cells at all. The single cells of the groups are small and their nuclei are pyknotic. The cell bodies are somewhat epithelioid in character. Some cells within and around these groups have become necrotic and only their pyknotic nuclei are preserved.

The deeper layers of the corneal stroma adjacent to these most superficial ones exhibited a somewhat different pattern of pathologic stromal cell involvement. The stromal cells in these layers were also piled up in nestlike groups. But they showed signs of active proliferation (figs. 11 and 12). Their cell bodies were star-shaped and they had somewhat larger nuclei. These cells exhibited a rather "amoeboid" character. In these deeper layers there was little hyalinization of corneal lamellae in some spots and single star-shaped stromal cells could be observed between the lamellar fibers.

It is important to emphasize that the changes of the stromal cells were virtually

the only pathologic finding in the deeper layers of the stroma. There was only slight involvement of the corneal lamellae.

The posterior layers of the stroma of this specimen exhibited normal corneal lamellae and virtually normal stromal cells. There was no hyalinization of the lamellar fibers. The stromal cells were interconnected and about normal in shape and size. Their cell bodies and processes appeared somewhat swollen, and the protoplasm contained vacuoles of different sizes. The nuclei were larger than normal (figs. 13 and 14).

No nerves were found in the superficial layers of the corneal stroma. Some nerve fibers—but not as many as in a normal cornea—were seen in the deeper layers of the stroma.

Descemet's membrane and the corneal endothelium were essentially normal. The endothelium showed artificial damage which might be the result of surgical trauma or an histologic artefact.

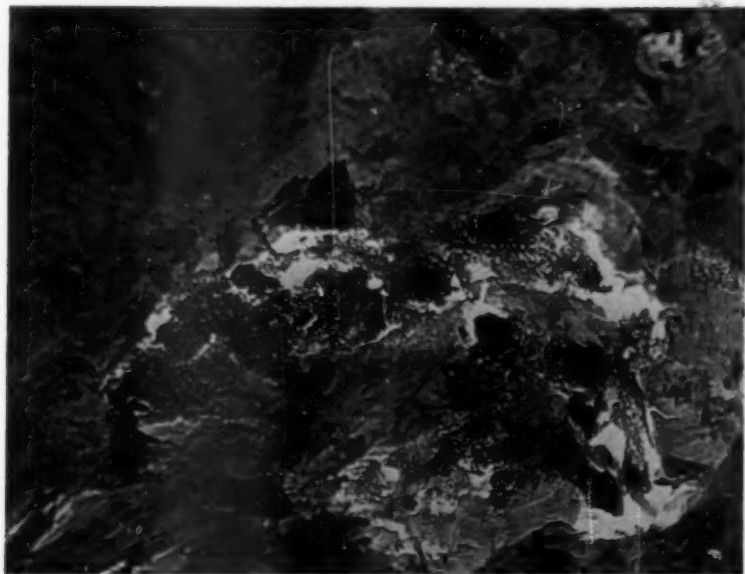


Fig. 11 (Wolter and Cutler). Group of active "amoeboid" cells in the middle layers of the stroma of the case of granular dystrophy. The corneal lamellae around these cells are not hyalinized. (Flat section, Hortege method, photomicrograph, $\times 600$.)

It must be emphasized that there was no infiltration or vascularization to be found in all layers of the corneal button of this case.

DISCUSSION

In 1898, Groenouw³ published histologic studies of eyes with granular dystrophy of the cornea. He found the clinically observed opacities to be composed of an "amorphous substance which might be hyaline." This substance was found to be accumulated beneath the epithelium and in the superficial layers of the corneal stroma. He also reported that Bowman's membrane had partly disappeared and was replaced by the hyaline masses. There were only minimal changes of the epithelium and no inflammatory reactions were seen. Groenouw believed that these hyaline masses were the result of degeneration of the superficial corneal stroma.

Later authors found virtually the same pathologic process in this condition but failed to demonstrate further histologic details.

Franceschetti and Babel⁷ were able to prove that the hyaline masses in the stroma represent the result of hyaline degeneration of superficial corneal lamellae. They demonstrated that the histologically somewhat different (basophilic) hyaline bodies of the subepithelium develop by deposition of hyaline in this space.

Fleischer⁶ mentioned the severe involvement of the stromal cells (corneal corpuscles) in the pathologic alteration of the cornea in granular dystrophy. He described some of these cells to be swollen in one of his cases. In two other cases he found the superficial stromal cells to be proliferated and of an "amoeboid" or "epithelioid" shape. They were arranged in nestlike clusters. Wehrli¹³ had seen this proliferation, epithelioid character, and nestlike accumulation of these cells before and considered the disease for this reason as tuberculosis or "lupus of the cornea."

Duke-Elder⁵ summarized the knowledge

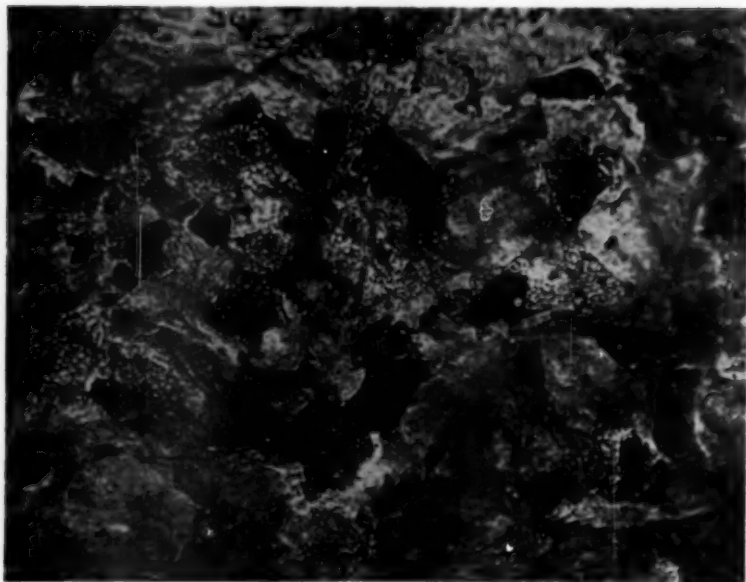


Fig. 12 (Wolter and Cutler). Large group of proliferating "amoeboid" stromal cells in the middle layers of the stroma of the cornea with granular dystrophy. (Flat section, Hortege method, photomicrograph, $\times 600$.)



Fig. 13 (Wolter and Cutler). Virtually normal stromal cells of the posterior layers of the corneal stroma of this case of granular dystrophy. The cells show only slight deformation and swelling. The corneal lamellae are normal. (Flat section, Hortege method, photomicrograph, $\times 600$.)

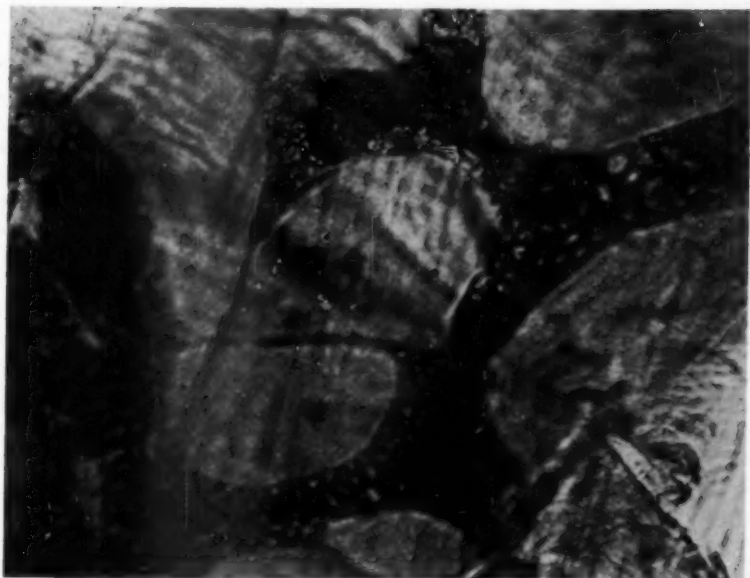


Fig. 14 (Wolter and Cutler). High-power view of virtually normal stromal cells of the posterior stroma of the cornea with granular dystrophy. (Flat section, Hortega method, photomicrograph, $\times 1,000$.)

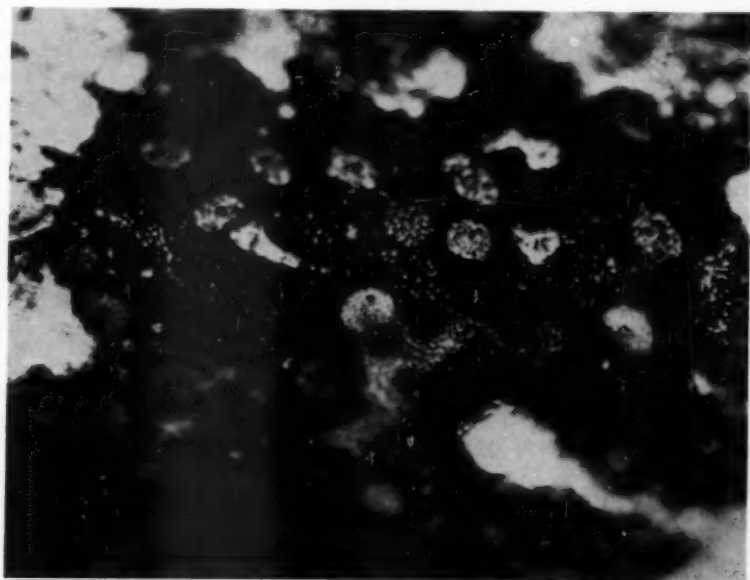


Fig. 15 (Wolter and Cutler). Fragment of normal endothelium of the corneal button of the patient with granular dystrophy. (Flat section, Hortega method, photomicrograph, $\times 600$.)

of the pathology of granular dystrophy* in 1938 as follows: "The essential change appears to be a deposition of hyaline between the lamellae of the superficial stroma, followed by the separation, swelling and disintegration of the lamellae and corpuscles, flattening of the epithelium above the nodules, and the ultimate destruction of Bowman's membrane."

The findings in the present case fit very well into the earlier pathologic descriptions of this entity. There is no doubt that the hyaline bodies as found histologically in the superficial stroma and subepithelium represent the histologic equivalent of the granular opacities of the cornea. It must be emphasized, however, that too little attention has been given to the changes of the stromal cells in this condition.

The present case exhibits different stages of deformation, proliferation, degeneration, and destruction of these cells. And it is obvious that the most severe changes of the stromal cells are found in the superficial stroma while these cells become more and more normal as one proceeds to the posterior stroma. In the middle layers of the stroma the changes of the stromal cells are virtually the only pathology and the corneal lamellae are normal. These findings indicate that the degeneration of the stromal cells of the cornea in this condition represents the primary pathologic defect and that the hyalinization of the corneal lamellae occurs secondary to the cellular changes.

* Duke-Elder classified this condition as nodular dystrophy.

It is generally accepted in eye pathology that hyalinization represents a rather non-specific process which may occur in many different ocular tissues following cellular degeneration.¹⁴ It is not possible to conclude from a histologic study of such an advanced pathologic situation as described in this specimen what might be the cause of this primary degeneration of the corneal stromal cells. However, it is our impression that this entity belongs to the group of the primary heredodegenerative diseases and could therefore be called a heredodegeneration of the corneal stromal cells which begins in the superficial stroma and proceeds posteriorly.

The absence of nerve fibers in the central stroma of this case is an interesting observation which might some day prove to be a key for the understanding of the degeneration of the stromal cells. As yet, however, the knowledge of the innervation of the corneal stroma is too limited to allow any conclusions from this finding.

SUMMARY

The histopathology of a typical case of granular corneal dystrophy is studied in an eight-mm. corneal button which was removed for corneal transplantation. Special attention is given to the changes of the stromal cells which appear to demonstrate the primary pathologic involvement in this cornea. These findings indicate that granular dystrophy represents a heredodegenerative disease of the stromal cells which begins in the superficial stroma and proceeds posteriorly.

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A CLINICAL AND ELECTROPHORETIC STUDY OF PATIENTS WITH UVEITIS*

WITH REFERENCE TO THE POSSIBLE ASSOCIATION OF SYSTEMIC COLLAGEN DISEASE

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This is a report on the results of a clinical and laboratory study undertaken to explore a possible relationship between collagen disease, other than rheumatoid arthritis, and uveitis.

There are at present a large number of comprehensive reviews on the classification, symptomatology, possible etiology, pathology, and chemistry of the various collagen diseases.¹⁻⁶ For our purposes here it is sufficient to say that the diseases usually classed under this head are rheumatoid arthritis, rheumatic fever, polyarteritis nodosa (essential polyangiitis), disseminated lupus erythematosus, diffuse scleroderma, and dermatomyositis. Occasionally included in this classification are certain forms of renal disease, subacute bacterial endocarditis, and certain skin diseases, including erythema multiforme.

It is immediately obvious that these are a heterogeneous assortment of clinical syndromes. However, they are bound together by one common denominator—a degeneration of the so-called collagen tissue. By "col-

lagen tissue" is meant the connective-tissue system as a whole, not solely the fibrillar elements—collagen, elastin, and reticulin. In fact, the initial and probably the most important pathologic change is in the amorphous ground substance. This collagen degeneration is not an isolated local phenomenon, but to a greater or lesser extent the entire connective-tissue system participates in the change.

The widely different clinical symptomatology, and the variations in the disease picture, are believed to be due to the distributions of the collagen and the individual organ response to insult. The etiology of these diseases is unknown. At various times tuberculosis, endocrine disturbances, an abnormal gamma globulin, infection, and various forms of hypersensitivity have been suggested. It is believed by many that these different factors serve only as trigger mechanisms.

The ocular complications and pathology of these collagen diseases have been the subject of many excellent reviews (Kurz⁷ 1938, Vail⁸ 1952, Stillermann⁹ 1951-55, Christensen¹⁰ 1951, Zimmerman¹¹ 1956, and others).

Primarily, it is recognized by practically all writers that nongranulomatous uveitis frequently occurs in association with generalized rheumatoid arthritis, and with a

* From the Wilmer Ophthalmological Institute of The Johns Hopkins University and Hospital. This investigation was supported in part by a grant from the National Institute of Neurological Diseases and Blindness of the United States Public Health Service.

much higher frequency in the Marie Strumpel form of the disease. It is also recognized that uveitis rarely if ever occurs in association with rheumatic fever, when the ocular changes are limited to small foci of optic choroiditis, much like the so-called Roth's spots seen in subacute bacterial endocarditis.

Second, in the collagen diseases, other than rheumatoid arthritis, various other late inflammatory ocular changes, such as episcleritis, scleritis, rheumatic nodules, scleromalacia perforans, and so forth, have been attributed to collagen degeneration. These late ocular inflammations do not concern us here. What does concern us is the possibility of a relationship between the collagen diseases, other than rheumatoid arthritis, and uveitis. Such a relationship has been suggested by a number of authors, and specific cases of nongranulomatous iritis associated with periarteritis nodosa have been reported by Goar and Smith,¹² by Wise,¹³ and by others. It has recently been suggested by Klien¹⁴ (1956) that local collagen degenerations may occur in the retinal and choroidal vessels as an isolated phenomenon without any concurrent systemic changes, and may thus be responsible for some hitherto obscure forms of chorioretinitis, such as the noninfectious form of choroiditis juxta-papillaris.

In the spring of 1956, a case of recurrent nongranulomatous iritis (No. 736583) specifically directed our attention to the possible relationship of uveitis to collagen diseases other than rheumatoid arthritis. In this patient, the first attack of uveitis had followed a polyarthritides six years previously. At that time a diagnosis of rheumatoid arthritis had been made on the clinical and X-ray findings. Except for this there was nothing in the history to suggest collagen disease. Examinations in the Wilmer Institute in 1956 showed a marked bacterial hypersensitivity and immunologic evidences of an old *Brucella* infection.

The consulting internist, Dr. J. E. Moore, was dissatisfied with the earlier diagnosis of

rheumatoid arthritis, and had a buffy coat smear of the blood made. This disclosed one typical lupus cell, several suggestive ones, and much extracellular material. No other evidences of collagen disease were found but this was sufficient to establish the diagnosis of disseminated lupus. At this same time Dr. Moore called our attention to three of his patients whose serums had given biologic false positives in the Wassermann reactions, in whom collagen disease was suspected, and who, at one time or another, had suffered attacks of uveitis. Unfortunately, there was insufficient information on the histories of these patients to classify the type of uveitis or rule out other possible etiologies.

In view of these observations it seemed worth while, as a part of the general study of the uveitis problem, to explore a possible relationship between uveitis and collagen disease, other than rheumatoid arthritis. Henceforth, in this report, the term "other collagen disease" is used to describe the various syndromes usually listed under this heading, with the exceptions of rheumatoid arthritis and rheumatic fever, that is, notably lupus erythematosus, periarteritis nodosa, and scleroderma.

How can a possible relationship between uveitis and the other collagen disease be explored? Primarily, it seemed that the suggestion that local disease of the ocular collagen could occur without concurrent systemic involvement can be dismissed. Such a suggestion is not in accord with the usually accepted concepts of the nature of collagen disease. Further, there is no way such a suggestion could be explored other than by the histologic demonstration of collagen degeneration in the excised eye, and at the same time presenting convincing evidence that there were no systemic changes in the collagen tissues. Therefore, until some better method of approach could be devised, it appeared that the only practical method of investigating this problem was a study of patients with uveitis for evidences of other col-

lagen disease, and a similar study of patients with proven collagen disease for the presence of uveitis.

The file of uveitis cases occurring in the Wilmer Institute since 1948 contains approximately 900 patients on whom a complete diagnostic survey had been made. This file was first reviewed in a search for any cases of uveitis associated with the other collagen diseases. In the 1950 file one such case was found (No. 183730). This was a case of non-granulomatous iritis in a Negress, aged 48 years, with a previously negative medical history. After the extraction of periapically infected teeth the iritis cleared and has not since recurred. Four years later, this patient developed a migratory polyarthritis, and a buffy coat smear of the blood disclosed L-E cells.

Other than this one case, in which the symptoms of systemic lupus postdated the attack of iritis by four years, there was no instance of iritis or uveitis associated with any collagen disease other than rheumatoid arthritis. In these uveitis histories there were no specific notes of retinal hemorrhages, cytooid bodies, or changes in the retinal vessels—the fundus picture generally associated with the other collagen diseases. While these patients had all had medical histories taken and complete physical examinations made by a competent internist, nevertheless, it must be admitted that no special attention had been directed to the possibility of the other collagen diseases, and no particular search had been made for evidence of such disease.

The second avenue of approach was a review of the histories of patients with other collagen disease, searching for evidences of uveitis. Fortunately, lupus erythematosus had recently been the subject of a special investigation by the Department of Medicine at The Johns Hopkins Hospital, and the full symptomatology of 136 patients with this disease had already been tabulated by Harvey and his associates.⁸ In 105 of these patients there were notes of examination of the

eyes. Cytooid bodies, cotton-wool exudates, retinal hemorrhages, episcleritis, and so forth, were noted in approximately 25 percent of these cases (Tumulty¹⁸ 1954), but there were no cases of uveitis.

In addition to the cases of lupus erythematosus, there were 23 cases of periarteritis nodosa and 11 cases of scleroderma listed in the diagnostic file, from 1950 to the date of the last entry. A review of these histories showed five cases respectively of cotton-wool exudates, hypertensive retinopathy, papilledema, and venous occlusion—an incidence of 22 percent. There were no cases of present or past uveitis. A review of the 11 patients with scleroderma was likewise negative for any evidence of uveitis.

Since it was evident that little information could be gleaned from a review of the histories of these patients with either uveitis or collagen disease, it appeared the only practical way of further investigating this problem was an especial study of uveitis patients for any clinical or subclinical evidences of collagen disease. Accordingly, such a study was undertaken.

MATERIAL AND METHODS OF STUDY

From July 1, 1956, to June 30, 1957, 32 patients with nongranulomatous uveitis, and 26 patients with granulomatous uveitis were studied intensively for evidences of "other" collagen disease. Fifty of these 58 patients had been referred to us for diagnostic study to determine, if possible, the cause of their uveitis; six were patients on the public wards of the Wilmer Institute, and two were private patients of Dr. Maumenee, who was kind enough to allow us to examine them, and to include them in this series. The uveitis was active in 34, and inactive in 24 patients.

In addition to the usual diagnostic survey, the details of which have been outlined elsewhere,¹⁶ these patients were all examined by medical consultants alerted to the investigation. The patients were specifically questioned for a history of unexplained fever,

pleurisy, renal involvement, respiratory disease, migratory myalgia or arthralgia, easy bruising, thermosensitivity, and undue fatiguability. Complete blood examinations for evidence of normocytic or normochromic anemia, for a depression in the platelets, an increase in the sedimentation rate, or changes in the differential count, were made in all patients. The full details of these examinations were available for analysis in all except 10 patients in whom the examinations were reported merely as normal or negative. Buffy coat preparations of the blood were made and lupus cells sought for in all suspicious cases.

Although the cephalin flocculation and thymol turbidity estimations are primarily tests for liver disease, nevertheless the cephalin flocculation test is believed dependent on an increase in the gamma globulin, and the thymol turbidity reaction is supposed to be related to the lipids and lipoproteins migrating electrophoretically in the beta globulins and also to an increase in the gamma globulin. On the hope these tests might throw some light on the problem at hand, they were included in the list of the laboratory examination.

Clinical determinations of the total serum albumins and total globulins were done on 55 of the 58 patients. Paper electrophoretic estimations of the albumins—the alpha-1, alpha-2, the beta, and the gamma globulins—were done on all 58 patients.

Paper electrophoresis is dependent on the separation of complex substances into their various component parts in an electrophoretic field, and the absorption of these various fractions by filter paper. Since the different fractions migrate in the electrophoretic field with different velocities, they are absorbed by the filter paper in separate zones. In the case of the blood plasma the albumins, the alpha, beta, and gamma globulins, the various lipoproteins, lipids, polysaccharides, and so forth, all migrating with different speeds, are absorbed in characteristic bands. Under certain rigid conditions this filter paper is then stained with the dye appropriate for the

various substances, bromphenol blue or amidoschwarz for the serum proteins, the Sudan dyes for the lipoproteins and lipids, ninhydrin for the amino acids, and the periodic acid-Schiff reaction for the carbohydrates. In this investigation, only the protein fractions were studied.

Once the bands are stained, the relative or exact quantities of the various fractions can be determined. The relative values are obtained by measuring the density of the various bands with a densitometer, filling in the resulting curves with a planometer, and comparing these curves with those of known normal serum, the electrophoretic pattern of which was determined in similar manner. The concentration of the albumin and globulin fractions is then expressed in relative percentages of the normal. For exact quantitative analysis, the filter paper is cut into bands about 0.5 cm. in width and after elution, the dye-stuff content of each band is determined photometrically. From this figure the exact amount of the individual fractions is calibrated.

It is well known that the albumin fraction is often decreased in the collagen diseases and the gamma globulin is increased. It was, therefore, hoped that the determinations of the electrophoretic pattern might give us some indication of subclinical collagen disease. In addition to this, the behavior of the various plasma proteins in active and inactive uveal inflammation appeared to be a most attractive field to explore.

RESULTS

CLINICAL STUDIES

One patient in this series gave a substantiated history of almost certain vascular collagen disease (Case 1). Two other patients gave histories, or presented physical evidence highly suggestive of vascular collagen disease (Cases 2 and 3). During the year 1956-57, there were two other patients with uveitis referred here in whom earlier diagnoses of collagen disease had been made elsewhere. In one of these patients (included in this series)

this previous diagnosis was not confirmed. In the second patient (No. 751280) with recurrent nongranulomatous iritis, the earlier diagnosis of Raynaud's disease and scleroderma appeared correct, but the one attack of Raynaud's disease had antedated the onset of the iritis by two years. There had been recurrences of the iritis but no recurrences of the Raynaud's disease or the scleroderma. Since an electrophoretic study was not done on this patient the case is not included in this series. The details of Cases 1, 2, and 3 are:

CASE 1

A 29-year-old white woman six years previously had developed a classical Raynaud's disease. She gave a history of undue fatigability and thermosensitivity. Examination showed a labile type of hypertension and some questionable renal involvement. Both the cephalin flocculation and thymol turbidity tests were positive but no L-E cells were found in the blood. The chemical estimation of the serum globulins was at the upper limit of normal. There was an increase in the beta globulins. Thus far, it would have made an excellent case of uveitis secondary to collagen disease. Unfortunately for such a diagnosis, the uveitis was of the granulomatous type, it postdated the attack of Raynaud's disease by four years, it had every clinical characteristic of tuberculosis, there was a family history of tuberculosis, and the patient was violently hypersensitive to tuberculin. Under antibacterial therapy with streptomycin and Isoniazid the extremely active uveitis quieted quickly. The picture was clearly that of a tuberculous uveitis in a patient with an apparently unrelated vascular collagen disease.

CASE 2

A 30-year-old white man had a history of tonsillitis in childhood and a tonsillectomy at the age of eight years. Thereafter he developed a heart murmur but there was no history of arthritis. The present illness began with blurring of vision in November, 1956, six months prior to examination. A diagnosis of bilateral uveitis was made. The uveitis yielded to steroid therapy. Since then there has been some recurring smoldering activity.

Examination showed the right vision reduced to 20/70. There were a few small keratic deposits on the center of the cornea, otherwise the anterior ocular segment was normal. Ophthalmoscopic examination of the right eye showed retinal and subretinal edema, most marked in the foveal area, and there was a small relative central scotoma. In the left eye the vision was 20/20. The slitlamp examination was negative. There was some remarkable sheathing of the veins in the lower fundus, a small area of superficial gliosis in the upper temporal fundus, and a classical localized constriction of the upper nasal artery.

The medical survey revealed a normal physical

examination. There was a slight normocytic anemia and the corrected sedimentation rate was 28. The urine and renal functions were normal. No foci of infection were found. No evidence of any granulomatous disease was discovered. The blood chemistry was entirely normal, except for a slight increase in the alpha globulins. Repeated blood studies for lupus cells were negative. There was a marked bacterial hypersensitivity to 10 strains of the subgroup A of the beta streptococci. There was a peculiar skin lesion on one leg which raised the suspicion of scleroderma. Biopsy of this lesion showed it was the ordinary necrobiosis lipoidica. In short, while early collagen disease was suspected no substantiating evidence for it could be found. The constriction of the retinal arteriole and the peripheral sheathing of the veins was unexplained. The only possible diagnosis, and this was certainly tenuous, was a unilateral posterior nongranulomatous uveitis, now inactive, probably dependent upon a bacterial hypersensitivity.

CASE 3

A 28-year-old white woman, had a history of failing vision beginning two years previously. The past history disclosed an unexplained attack of pleurisy, an old periphlebitis of the right femoral vein, and a persisting low-grade anemia. There was no history of thermosensitivity, easy bruising, or undue fatigability. Examination of both eyes showed entirely atrophic disseminated lesions scattered through both fundi. In many instances they occurred at the termination of the capillaries. They were almost the size of an ordinary cytoid body. Some had a fine pigmentation, suggesting the pigment epithelium had been involved. Others were more superficial without pigmentation. There was no evidence of any active uveitis. There were no spasms or constrictions of the retinal arterioles, and no retinal hemorrhages. The nature of the retinal lesions could only be surmised. It was quite possible they represented the end-results of a previous disseminated retinopathy caused by a seeding out of bacteria from a bacteremia. They might conceivably have been the end-result of previous cytoid bodies.

The medical survey was almost entirely flat except for a very low-grade depression of the hemoglobin and the red blood cell count, and a moderate degree of hypersensitivity to four strains of the streptococci. The physical examination was negative. No foci of infection were found. The blood chemistry was entirely normal with a normal electrophoretic pattern. Repeated buffy coat smears for lupus cells were negative. Biopsy of a lymph node showed only reticular hyperplasia. In short, no evidence of any kind was found which would bolster the suspicion of collagen disease. No final diagnosis could be made. The probability was the retinal scars represented the end-picture of an old focal retinopathy, and the bacterial sensitivity was an evidence of the same process.

In summary, the clinical studies, with one

exception, failed to reveal any conclusive evidence of collagen disease in any patients with either granulomatous or nongranulomatous uveitis. The one exception was a case of granulomatous tuberculous uveitis in a patient with a previous history of vascular collagen disease. In this patient the uveitis and the collagen disease were clearly unrelated disease entities. In two other patients with inactive and somewhat doubtful nongranulomatous uveitis, there were retinal findings faintly suggestive of lupus erythematosus or periarteritis nodosa. In one of these patients, there was some slight supporting evidence to be found for this supposition. In the second case, there was practically none.

A. HEMOCYTOLOGY: SEDIMENTATION RATE

Significant elevations in the corrected sedimentation rate were found in four patients. Two of these could be explained on the basis of active infection—in the teeth and in a spreading urinary tract infection. The third elevation occurred in Case 2, already described, in which there was a lurking suspicion of subclinical collagen disease which could not be substantiated. The fourth elevation in the sedimentation rate could not be explained. It occurred in a patient with inactive nongranulomatous uveitis with a high degree of bacterial hypersensitivity, but with no foci of infection. However, there was no evidence which suggested collagen disease.

Anemia. A low-grade normocytic anemia was present in four cases. One of these cases was Case 3, already described. One occurred in a patient with nongranulomatous and two in patients with granulomatous uveitis.

A fifth patient, a child with a palpable spleen, had a low-grade hypochromic, normocytic anemia with a leukopenia and a relative lymphocytosis. A sixth patient, with nongranulomatous uveitis, had a leukopenia and a relative lymphocytosis. No explanation for these blood changes were found in any of these six patients. A repeated search for lupus cells was negative in all.

Elevation of the white cell count was found in five patients. All of these patients had been subjected to heavy steroid therapy immediately before being seen. In all five the white count fell as treatment was tapered off and discontinued.

Platelets. No abnormalities in the platelets were found in any of the patients included in this report.

Buffy coat smears. Buffy coat smears and examinations for lupus cells were made in all cases in which there was any evidence of rheumatoid arthritis or any suspicion of other collagen disease. In all, the blood of 17 patients was thus examined. In especially suspicious cases (Cases 2 and 3), these examinations were repeated three times. The examinations in all 17 patients were negative for lupus cells. In one patient there was some homogenous extracellular material of unknown significance.

B. LIVER FUNCTION TESTS

The cephalin flocculation and thymol turbidity tests were positive in only three patients—in the patient with leprosy—in Case 1, the patient with vascular collagen disease, and, third, in a woman 43 years of age with active granulomatous uveitis, a +++ reaction to toxoplasmin and a Sabin-Feldman dye test of 1:1,028. The total serum globulin was 3.3 gm. percent, and the electrophoretic pattern showed an increase in the beta globulins. There was nothing in the history or clinical findings remotely to suggest collagen disease. No L-E cells were found on repeated examinations. In all other patients these tests were negative. It appears they are probably without value in the search for evidence of subclinical collagen disease.

C. SERUM PROTEINS

Table 1 shows an analysis of the serum proteins in the two groups of uveitis.

Albumins. Both the chemical determinations and the electrophoretic estimations of the albumins showed little deviation from normal. In only one instance was the albumin

TABLE 1
ANALYSIS OF SERUM PROTEINS

Type of Uveitis	Chemical Determinations				Electrophoretic Estimations				
	No. of Patients	Serum Albumen	Serum Globulin	No. of Patients	Albumen	Globulins			
						Alpha-1	Alpha-2	Beta	Gamma
Granulomatous	23	Normal = 23	Normal = 18	26	Normal = 25	Normal = 11	Normal = 16	Normal = 13	Normal = 16
		High = 0	High = 1		High = 0	High = 5	High = 4	High = 10	High = 1
		Low = 0	Low = 4		Low = 1	Low = 10	Low = 6	Low = 3	Low = 9
		Average = 4.2%	Average = 2.5%						
Non-granulomatous	32	Normal = 31	Normal = 25	32	Normal = 30	Normal = 16	Normal = 17	Normal = 21	Normal = 18
		High = 0	High = 3		High = 1	High = 7	High = 8	High = 4	High = 3
		Low = 1	Low = 4		Low = 1	Low = 9	Low = 7	Low = 7	Low = 11
		Average = 4.9%	Average = 2.3%						
Totals	55	Normal = 54	Normal = 43	58	Normal = 55	Normal = 27	Normal = 33	Normal = 34	Normal = 34
		High = 0	High = 4		High = 1	High = 12	High = 12	High = 14	High = 4
		Low = 1	Low = 8		Low = 2	Low = 19	Low = 13	Low = 10	Low = 20

Standards.

Normal range for albumen = 4.0-6.0 gm. percent.

Normal range for globulin = 1.8-2.9 gm. percent.

fraction elevated—a 25 percent elevation in a patient with an uncomplicated nongranulomatous uveitis who had been under observation for two years, who was receiving bacterial desensitization therapy and whose eyes were free from all recurrences. There were two patients in whom the albumins were decreased. One was a patient with a tuberculous periphlebitis, who showed no evidence whatsoever of collagen disease. The second was a 57-year-old white man with a nongranulomatous uveitis. The possibility of collagen disease had been considered in this man, but no supporting evidence, other than the reduction in the serum albumins, could be found. There were no L-E cells found in the buffy coat smear. In all there was a 95 percent correlation between the chemical determinations and the electrophoretic determinations of the serum albumins.

Globulins. The behavior of the globulins was quite different from the albumins. On the 55 chemical determinations of the total globulins, 43 (78 percent) were normal, 11 (22 percent) were abnormal. Four of the latter were elevated, and eight were depressed. When the electrophoretic patterns were examined, the abnormalities were more marked. The deviations from normal were as follows: in the alpha-1 fraction, 31 (53 percent); in the alpha-2 fraction, 25 (44 percent); in the beta fraction, 24 (35 percent). About one half of these deviations were in-

creases, and one half were decreases.

The gamma globulins revealed the following pattern: 24 (41 percent) were abnormal. They were increased in four patients and decreased in 20, both increases and decreases being equally divided between the granulomatous and nongranulomatous groups.

In 40 patients (69 percent), there was reasonable correlation between the chemical determinations of the total globulins and the electrophoretic estimations. In 27 of these patients either the chemical determinations and the electrophoretic estimations were both normal, or if the chemical determination showed either an elevation or depression in the total globulins, this change was correctly reflected in the electrophoretic estimations. In 13 of these cases with an apparent overall correlation the chemical determinations of the total globulins were within normal range but examination of the electrophoretic pattern showed gross deviations which were not reflected in the chemical determinations. In these patients the electrophoretic pattern showed increases in some of the globulin fractions, and decreases in others—these elevations and depressions apparently cancelling each other out. In 12 patients these deviations involved the gamma globulins—in nine cases a decrease was apparently masked by increases in the alpha or beta fractions, and in three cases sharp increases in the gamma globulins were masked by decreases in the

alpha or beta fractions. Had reliance been placed on the chemical determinations alone, these abnormalities in the gamma globulin would have been unsuspected and undetected. In the remaining 15 cases, while the chemical determinations of the total globulins were normal, there were nevertheless definite abnormalities in the electrophoretic patterns—increases in some patients, decreases in others. In six cases, these abnormalities involved the gamma globulins.

What is the reason for these discrepancies? Are they due to technical errors or have they any clinical significance?

In consideration of this question, it should be remembered that in the electrophoretic technique the quantitative estimations of the amounts of the globulin fractions are based on a comparison of the electrophoretic curves of these fractions with similar curves from a known normal control. Theoretically, the chemical determinations of the total globulins and the sum of the quantitative electrophoretic estimations should be roughly the same. However, the chemical determination can be normal while there are changes in the electrophoretic pattern, increases in one or more of the globulin fractions being compensated for by decreases in other fractions.

It should be further remembered that in the chemical separation of the albumins and globulins, there is a recognized tendency for some of the alpha globulins to precipitate with the albumins, giving a falsely high figure for the albumins and a correspondingly false low figure for the alpha-1 or 2 globulins. This error does not occur in the electrophoretic estimations.

Since the chemical determinations of the total globulins and the sum of the electrophoretic estimations should be roughly equal, are discrepancies between the two to be attributed to technical error in one or the other procedures?

It is generally believed that the electrophoretic estimation is the more accurate procedure. Therefore, when discrepancies be-

tween the chemical determinations of the total globulins and the electrophoretic estimations are present, more reliance should be placed on the electrophoretic results, and an explanation for them sought in the clinical symptomatology rather than attribute them to technical errors in the procedure.

COMMENT

There is little in this study to support the idea of any etiologic relationship between the other collagen diseases and uveitis. There was only one patient in this series (Case 1) who had both collagen disease and uveitis, and here the association was clearly incidental. In our over-all experience in the study of the etiology of uveitis there is this case, and the three other patients already mentioned, in which this association was noted. These are: Case 736582, which directed our attention to this question, Case 183730, discovered in the 1950 file, and Case 781201 seen in 1956 but incompletely studied. In three of these four cases, other etiologic factors which could explain the uveitis were found. The last case was recorded as of "undetermined etiology."

When this study was undertaken, it was thought that perhaps a study of the electrophoretic pattern of the serum protein, especially of the gamma globulins, might reveal some evidence of subclinical collagen disease. No idea could have been more erroneous. There were only four instances of elevated gamma globulins. Two of these could be amply explained on the grounds of an active infection—one patient had leprosy and the second the peculiar combination of advanced periapical dental infection and a severe balanitis. The third patient had some rheumatoid arthritis in the knees and an active ethmoiditis. The fourth patient with a gamma globulin of 150 percent of normal had a flat survey except for a violent bacterial hypersensitivity. There was no history suggestive of other collagen disease. No foci of infection were found and the L-E cell preparation was negative.

In every case in this series in which col-

lagen disease was suspected every possible avenue to confirm these suspicions was explored and nothing confirmatory was found. In short, this study has yielded only negative results as concerns the purpose for which it was undertaken.

Although it is impossible to bring any supporting evidence of an actual etiologic or other relationship between other collagen disease and uveitis, it is interesting to speculate what actual relationships might theoretically exist. The following hypotheses appear to cover the possibilities:

1. That degeneration of the ocular collagen can *per se* excite a secondary inflammation in the uveal tract.

2. That the same tissue insult can cause both collagen degeneration and nongranulomatous uveitis.

3. That there is no relationship between collagen disease and uveitis. When they occur in the same patient, such association is incidental and unrelated.

If the first hypothesis is true, and one is unable to accept the assumption that disease of the ocular collagen can occur as an independent phenomenon, how can one explain the very low incidence of uveitis in all forms of systemic collagen disease other than rheumatoid arthritis? The only possible explanations are that either the ocular collagen is extremely resistant to the insult which causes systemic collagen degeneration, or that there is some rarely present accessory mechanism involved in the production of the uveitis. Both of these explanations are somewhat far-fetched, and certainly find no support in the negative study here reported.

The second hypothesis is more interesting. While the actual etiology of collagen disease is unknown, it is believed by many observers that one, or several, of the suggested etiologies may act as trigger mechanisms to activate the unknown etiologic factor which is specifically responsible for the collagen disease.

Hypersensitivity is probably the most popular of the various suggested etiologies, and

Rich¹⁷ has brought considerable experimental evidence indicating a relationship between hypersensitivity and periarteritis nodosa. In other communications¹⁶ evidence has been presented indicating that nongranulomatous uveitis is usually a hypersensitive inflammatory reaction. While the idea that periarteritis nodosa and nongranulomatous iritis are both related to, or dependent on, an underlying hypersensitivity does not bring this form of uveitis any closer etiologically to the general group of collagen diseases, it does offer a possible explanation for the occasional case of uveitis seen with these other collagen diseases—the two different clinical entities both being related to an underlying hypersensitive state.

The frequency with which nongranulomatous uveitis occurs in rheumatoid arthritis is not so easy to explain. Are the eyes especially sensitive to the insult which causes rheumatoid arthritis, or is the collagen tissue of the joints especially susceptible to the insult which causes nongranulomatous uveitis? Either could be the case. This is all very pleasant speculation, and it comfortably explains the confused picture in Case 2, and various other bothersome and perplexing worries. However, this pleasant and comfortable hypothesis is based on two totally unproven assumptions: first, that bacterial hypersensitivity acts as a trigger mechanism; and second, that there is some completely unknown etiologic agent specific for the collagen diseases which is especially sensitive to reactions produced by bacterial hypersensitivity.

Perhaps, for the time being, it is best to accept reluctantly the third hypothesis—that these "other" collagen diseases and uveitis are unrelated disease entities, and their occasional association is only a chance phenomenon. This appears to be true in Case 1, and is in accord with the other findings here reported. Certainly, this study indicates that in patients with either form of uveitis there is no undue tendency to collagen disease.

The study of the behavior of the serum

TABLE 2
DEVIATION OF SERUM GLOBULIN IN RELATION TO CLINICAL SYMPTOMATOLOGY

Type of Globulin	Deviations	No. of Deviations	Systemic Granulomatous Disease		Foci of Infection		Bacterial Hypersensitivity	
			Present	Absent	Present	Absent	Present	Absent
Alpha 1-2	Increases	24	14	10	12	12	12	12
	Decreases	32	27	5	4	28	17	15
Beta Globulin	Increases	14	11	3	3	11	3	11
	Decreases	10	7	3	2	8	7	3
Gamma Globulin	Increases	4	3	1	1	3	1	3
	Decreases	20	11	9	2	18	11	9

globulins in relation to the ocular symptomatology yielded some quite unexpected and somewhat mysterious findings.

The alpha globulins migrate electrophoretically with the greatest speed. Their concentration is known to be increased in chronic infection, in tissue injury, in progressive tuberculosis, malignant disease, and in rheumatoid arthritis. The beta globulins move less readily and rarely deviate in tissue injury. They are significantly increased in certain liver diseases, acute hepatitis, hepatic cirrhosis, and also in hyperthyroidism. Deviations in the gamma globulins are much more significant, and increases in their concentration coincide chiefly with a rise in the circulating antibodies. The gamma globulin remains normal in the first five to seven days of infection, then rises rapidly as circulating antibodies appear. Marked increases occur in some chronic infections—in osteomyelitis, tuberculosis, and bacterial endocarditis. Less striking rises occur in other bacterial and viral infections. They are usually increased in hepatic disease. They are usually increased in collagen disease, where, according to Ehrlich, there is an abnormal gamma globulin which is related to the pathogenesis of the disease. The gamma globulins are decreased in the nephrotic syndrome.

Efforts to correlate the deviations of the alpha globulins with any clinical abnormality in the patients with systemic disease, foci

of infection, bacterial hypersensitivity, and so forth, were fruitless (table 2). There were 24 patients who had showed elevations in one, or usually both, of the alpha globulins, while 32 patients showed decreases. With one exception, elevations and depressions of the alpha globulins occurred without any obvious relation to any clinical facts. The one exception was a patient with an extensive and spreading urinary tract infection. This patient showed a marked, very extensive migration of the alpha globulins, a phenomenon to be expected with a secondary infection.

There were somewhat less deviations in the beta globulins. There was a much higher incidence of increase in the granulomatous uveitis patients than in the nongranulomatous—35 percent against 12 percent. Likewise, there were a smaller incidence of decreases of the beta globulin in the granulomatous group than in the nongranulomatous group—11 percent against 28 percent. When the increases and decreases were examined in relation to the ocular and general symptomatology of the individual patient, one very surprising finding was noted.

Fourteen patients in all had increases in the beta globulins. Thirteen of these had active ocular inflammation—three a nongranulomatous uveitis and 10 the granulomatous form of the disease. The 14th patient with an increased beta globulin had just recovered from a sharp attack of nongranu-

TABLE 3
DEVIATION OF GLOBULIN FRACTIONS IN ASSOCIATION WITH ACTIVITY OF THE UVEITIS

Type of Uveitis	No. of Cases	Alpha-1		Alpha-2		Beta		Gamma	
		In-creased	De-creased	In-creased	De-creased	In-creased	De-creased	In-creased	De-creased
Nongranulomatous Active	16	1	4	2	3	3	2	2	2
Granulomatous Active	18	6	6	2	1	10	3	1	11
Nongranulomatous Inactive	16	3	4	3	4	1	5	1	6
Granulomatous Inactive	8	1	4	2	4	0	0	0	1
Total Active Cases	34	7	10	4	4	13	5	3	13
Total Inactive Cases	24	4	8	5	8	1	5	1	7

lomatous iritis. However, while increases in the beta globulin occurred almost exclusively in patients with active ocular disease, the converse was not the case. There were a total of 34 patients in whom the uveitis was considered active. In only 13 of these (40 percent) were the beta globulins elevated (table 3).

The gamma globulins showed several interesting and unexpected deviations. Decreases in the gamma globulins were much more frequent than were increases—20 to four respectively. In the 16 patients in whom a nongranulomatous uveitis was active, the gamma globulins were increased in two, were normal in 12, and were decreased in two. In the 16 patients with inactive nongranulomatous uveitis the gamma globulins were increased in one, were normal in nine, and were decreased in six. In the granulomatous group the behavior of the gamma globulins appeared significantly different. In the 18 patients with active uveitis the gamma globulins were increased in one (the patient with advanced leprous uveitis) were normal in six, and were markedly decreased in 11. In the eight patients with inactive uveitis, these gamma globulins were increased in none, were normal in seven, and were decreased in one.

The significance of this depression of the gamma globulins in association with active granulomatous uveitis is somewhat difficult

to explain. It may possibly be an indication of a failure of antibody response or of the general immunity which permits a systemic granulomatous disease to extend to the eye. On the other hand, it may be that the only active focus of disease is in the eye, and that the antigenic stimulus from such a relatively small lesion is insufficient to evoke a generalized antibody reaction. This latter explanation, however, would scarcely explain the depressions of the gamma globulins in active uveal inflammation.

The distribution of these deviations of the alpha, beta, and gamma globulins in the two types of uveitis and in active and inactive disease is shown in Table 3.

CONCLUSIONS

1. A clinical and laboratory study of 58 patients with various forms of uveitis has revealed no undue incidence of either clinical or subclinical collagen disease. One patient with granulomatous uveitis had vascular collagen disease, but there was convincing evidence these were unrelated phenomena. In two patients with atypical possible nongranulomatous uveitis, the history and fundus picture aroused a suspicion of sytemic subclinical collagen disease but there was little supporting evidence for this suspicion uncovered.

2. A review of the histories of approximately 900 patients with uveitis seen since

1948 has revealed only three other cases in which uveitis occurred in association with past or present collagen disease, other than rheumatoid arthritis. In two of these patients other etiologic factors to explain the uveitis were present.

3. A review of the histories of patients seen in The Johns Hopkins Hospital since 1950, and diagnosed as lupus erythematosus, periarteritis nodosa, or scleroderma, failed to reveal any instance of uveitis associated with these diseases.

4. Unexpected variations were found in the electrophoretic pattern of the serum globulins in a number of patients with uveitis. Efforts were made to correlate these changes with the clinical symptomatology of the patient. Increases or decreases in the two alpha

globulins appeared totally unrelated to any ocular or systemic symptomatology. Increases in the beta globulins were observed only in patients with active, or recently active, uveitis, but conversely only about 40 percent of the total number of patients with active uveitis had elevations in the beta globulins. Surprisingly, decreases in the gamma globulins were much more frequent than increases. These decreases in the gamma globulin were especially marked in patients with active granulomatous uveitis. It suggested that in patients with systemic granulomatous disease, and an extension of the disease process to the eye, this decrease in the gamma globulins may be related to a depression of antibody formation or of systemic immunity.

The Johns Hopkins Hospital (5).

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BINOCULAR CORRECTIONS FOR LOW VISION*

RATIONALE FOR RULE OF THUMB FOR DECENTRATION

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Binocular corrections as strong as +10.0 diopters have been successfully prescribed for binocular use. It is an established fact that patients can experience binocular single vision with corrections of this strength.

The advantages of strong binocular corrections are: (1) Larger field of vision; (2) greater depth of focus; (3) improved visual acuity; (4) appearance of conventional glasses; (5) psychologic desirability because patients prefer to use both eyes.

The duration of the reading interval varies according to the strength of the correction and the patient's tolerance. Most people can read 10 to 30 minutes with reading additions of +10.0 diopters. Patients wearing weaker reading additions are able to read for much longer periods. A reading interval of 10 to 30 minutes without asthenopia may seem quite short. There are a great many vocations which do not require a reading interval of even 15 minutes; for example, physician, salesman, and housewife. In younger patients the reading distance is a little less due to the accommodation of the individual. This is the explanation for the inability of young persons to accept as strong a reading addition as those with presbyopia.

Binocular corrections can be prescribed in three different forms: (1) Full-size lenses. (2) half eyeglasses; (3) bifocals.

The advantage of the full-size lens is that the patient can very often use his old frames, keeping the cost at a minimum. If he finds the correction beneficial, he can later have the lenses made up in half eyeglasses or bifocals. The strongest binocular correction

in full-size lenses that I have prescribed is: O.U., +9.0D. decentered-in 9.0 mm. (8.1Δ base in) for each lens. This man's distant vision was: O.D., 8/200; O.S., 7/200. Diagnosis is bilateral retinal detachments which were reattached by diathermy with a limited functional result. This correction was prescribed in April, 1953, and makes it possible for this patient to be gainfully employed at the present time as manager of a claims department.

The advantages of half eyeglasses are that the patient can look up and see at a distance by looking over the lenses. Strong lenses are less conspicuous and lighter in this form because half lenses are less than half the size of regular lenses. They appear like conventional reading glasses. As much as a +10.0D. sph. with 10 prism diopters base-in can be prescribed for each eye in half-eye spectacles.

The advantages of bifocals are that the patient can look up and see at a distance

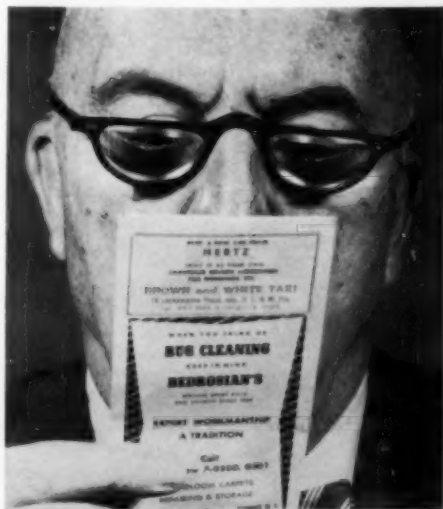


Fig. 1 (Fonda). Half eyeglasses.

* Aided in preparation by The Ophthalmological Foundation, Inc., New York, and Research Department of the New York Association for the Blind. This paper was presented before the Section on Ophthalmology at the annual meeting of the Medical Society of New Jersey, May 1, 1957.



Fig. 2 (Fonda). Binocular +10.0D. reading addition.

without taking off the glasses, when the distant correction improves the distant vision. Strong reading additions are light and inconspicuous in the bifocal form. The strongest binocular bifocal addition that I have prescribed was a +10.0D. These were prescribed April, 1954, for a 68-year old man with macular degeneration. The distant vision with the following correction was: O.D., +2.25D. sph. \ominus +1.5D. cyl. ax. 180°, 20/120; O.S., +2.5D. sph. \ominus +0.75D. cyl. ax. 180°, 20/160. Plus 10.0D. reading additions decentered-in 8.0 mm. for each eye was prescribed. These were made up in the cemented bifocal form. This man states that he could read from one to one and one-half hours with this correction. In March, 1956, the vision failed to 20/200 at which time a +24.0D. reading addition was prescribed for the right eye.

Adequate decenteration of reading lenses or bifocal segments is imperative. It is not possible to decenter-in the lenses or bifocal segments too much unless the patient manifests a high esophoria. This is a rare occurrence which to date I have not encountered. After reviewing the convergence required

for reading at 10 cm., this will be self-evident.

At a reading distance of 10 cm. 10 meter angles or 60 Δ of convergence are required for a 60 mm. interpupillary distance. For an interpupillary distance of 70 mm., 70 Δ of convergence are required for a reading distance of 10 cm. One prism diopter of convergence is required for each mm. of the distant interpupillary distance at a reading distance of 10 cm. Concluding from this fact it is advisable to decenter-in reading lenses or bifocal segments as much as possible. The limit of prism base-in created on conventional reading lenses or half eyeglasses is 10 prism diopters for each lens. Generally the maximum base-in prism that can be ground in a reading segment of a one-piece bifocal (Ultex type) is four prism diopters. Eight prism diopter prisms have been ground in the one-piece (Ultex B type

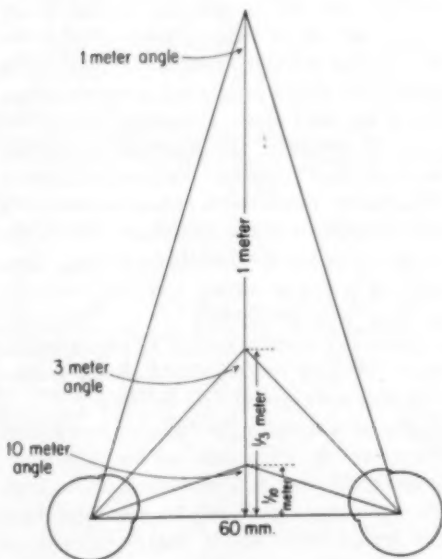


Fig. 3 (Fonda). 1 MA (meter angle) = 3 Δ for each eye. When a patient converges to a point 1 M. he requires 6 Δ of convergence. When a patient converges at a point 33 cm. (one-third M), he requires 18 Δ of convergence. When a patient converges 10 cm. (one-tenth M) he requires 60 Δ of convergence.

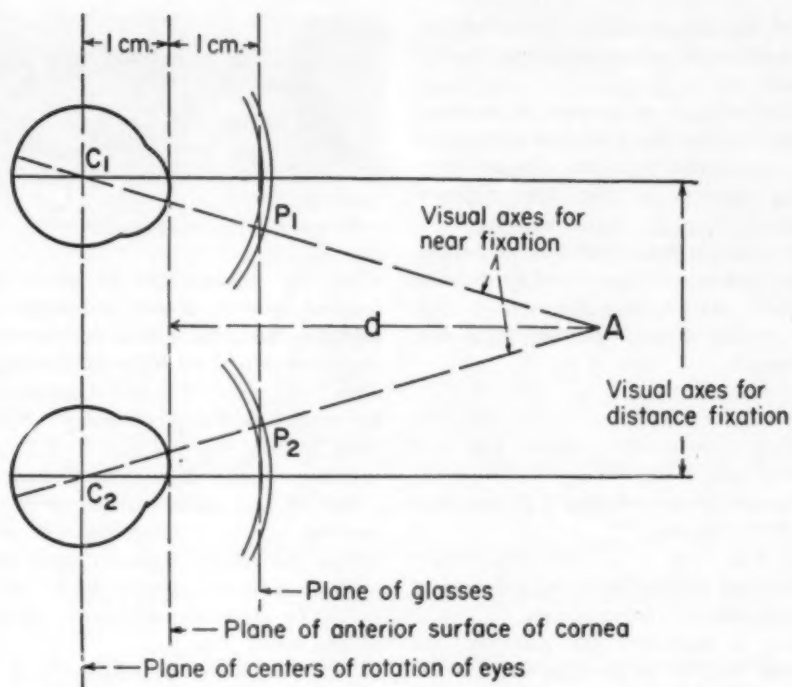


Fig. 4 (Fonda). Graphic method and formula for determining the proper centering of lenses for use at a near point. (From Tait, E. F.: Textbook of Refraction, Philadelphia, Saunders, 1951.)

C_1C_2 = distance between centers of rotation (interpupillary distance)
 P_1P_2 = distance between optical centers of lenses when fixing at near
 d = distance of near point object from anterior corneal surface
 A = fixation point at near

For example:

$$\frac{C_1C_2}{P_1P_2} = \frac{d+1}{d-1} \quad C_1C_2 = 65 \text{ mm}$$

$$P_1P_2 = ?$$

$$\frac{65}{P_1P_2} = \frac{11}{9} \quad d = 10 \text{ cm}$$

$$11 (P_1P_2) = 585$$

$(P_1P_2) = 53 \text{ mm}$. Therefore each lens or bifocal segment must be decentered in six mm. each for the reading distance.

segments). However, the lens manufacturers do not find this strength of prism segment practical for production.

Three prism diopters of prism is the maximum prism than can be ground into a fused bifocal segment such as the Ful-vue C and the Panoptik.

A rule of thumb for decentering near

vision lenses or bifocal segments is to de-center-in each lens or bifocal segment one mm. for each diopter of reading addition.

The rationale for this statement is supported by the comparison of decentration required by the precise methods of Lebensohn and Tait. The rule of thumb produces more decentration for the reading distance than

either of the above methods of calculation which is desirable because additional base-in is created.

The following is an example of an interpupillary distance for a reading distance of 10 cm. calculated from the distant interpupillary distance by the three different methods.

Lebensohn's rule states that the near interpupillary distance is determined by dividing the distant interpupillary distance, in mm., by the reading distance in inches plus one. For example:

	13
Distant P.D.—65 mm.	$5\sqrt{65}$
Reading distance—four inches (10 cm.)	
+1.0 inch = 5.0 inches	
Difference between distant P.D. and near P.D. = 13 mm.	
Near P.D. = 65 - 13 = 52 mm. Therefore each reading lens or bifocal segment is decentered in 6.5 mm. each.	

Figure 4 illustrates the principle and shows the method of deriving the formula for the calculation of the near interpupillary distance at spectacle level, according to Tait.

According to the rule of thumb each near-vision lens or bifocal segment must be decentered-in 10 mm. each. This demonstrates that the rule of thumb method requires in the strongest binocular correction four mm. more decentration for each eye than by the more accurate methods of Lebensohn and Tait. The additional decentration (base-in effect) is beneficial to the patient because eight prism diopters of convergence will be relieved in this case. Additional base-in prism ground on the reading lenses or bifocal segments increases the reading comfort at such short reading distances. When you recall that 65 prism diopters of convergence are required to read at 10 cm. even 14 prism diopters of base-in effect for each eye are not much for the patient with a normal muscle balance.

The Ultex AA or AL (one-piece bifocal) is ground with a reading segment of 38 mm. in its greatest diameter and the height at



Fig. 5 (Fonda). Ultex AA or AL (one-piece bifocal).

which the segment can be placed in the finished lens is almost unlimited. These features make the Ultex AA or AL the preferred bifocal for binocular reading additions from +6.0 to +10.0 diopters because the reading field is the largest of all bifocals made in these powers.

One-piece bifocals offer another advantage—that of less chromatic aberration at the junction of the reading segment and the distant correction. However, patients with low vision do not seem to be as much disturbed by chromatic or spheric aberrations as one would expect.

Patients with vision ranging from 8/200 to 20/40 can be benefited by binocular corrections ranging from +3.0 to +10.0 diopter reading additions. The severity of the visual defect corrected binocularly will depend upon the age, type of pathologic alteration, and perfection of vision required. Younger patients will do well because the available accommodation supplements the reading addition. As emphasized by Kestenbaum the near vision is better in comparison to the distant vision in peripheral opacities of the cornea and lens, high astigmatism, high myopia, and nystagmus. In cases where the visual requirement is not so great, binocular corrections are more suitable than better vision with a monocular correction.

SUMMARY AND CONCLUSIONS

1. Binocular vision for reading can be experienced with binocular additions as strong as +10.0 diopters.
2. Advantages of binocular correction for low vision: (a) Larger field of vision; (b) greater depth of focus; (c) improved visual

acuity; (d) appearance of conventional glasses; (e) psychologically desirable because the patient prefers to use both eyes.

3. Types of binocular reading correction: (a) Regular lenses; (b) half eyeglasses; (c) bifocals.

4. Rule of thumb for decentration states that the reading lenses or bifocal segments must each be decentered in one mm. for each diopter of reading addition.

5. Sixty-five prism diopters of convergence are required to read at 10 cm. for a

patient with a distant interpupillary distance of 65 mm. Consequently, it is impossible to create too much base-in prism in the reading correction for the patient unless he shows a considerable convergence excess. The range of low vision corrected by strong binocular reading additions is from 8/200 to 20/40. The range of vision suitable for binocular correction depends upon the age of the patient, type of ocular pathologic change, and visual requirement.

84 Baltusrol Way.

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METRETON: A CLINICAL STUDY*

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Our preliminary study and early report¹ indicated the clinical usefulness of a new metisteroid-antihistamine eyedrop for a wide range of ocular allergies. We present this follow-up report to relate further our experiences with this compound, now called Metreton Ophthalmic Suspension. More than a year of careful tests and repeated clinical trials in over 700 cases serve as a background for this paper. Chlortrimeton gluconate is a new salt of the well-known antihistamine chlor-trimeton. It is tolerated far better by the ocular and nasal tissues than its predecessor, chlor-trimeton maleate.² The superiority of prednisolone for ocular use is recognized and widely reported.³⁻⁸ We are currently studying the newer soluble steroid compounds and will report our findings later.

CLINICAL PROPERTIES

Metreton Ophthalmic Suspension combines the corticosteroid prednisolone ace-

tate (0.2 percent) with the antihistamine chlor-trimeton gluconate (0.3 percent).

The rationale of corticosteroid therapy described by Duke-Elder⁹ for the adrenocortical steroids explains the action in terms of "a temporary blockage of the exudative phases of inflammation and an inhibition of fibroblastic formation in the process of tissue repair, whether the cause of the disease is bacterial, anaphylactic, allergic, or traumatic." Prednisolone is approximately five times more potent than the older corticosteroids and is particularly suited to ophthalmic therapeutics.

Chlor-trimeton gluconate is an improved antihistamine having the properties of antagonizing many characteristic effects of histamine. As generally recognized the theory of action of the antihistamines is, according to Feinberg¹⁰: "Ordinarily histamine would be adsorbed by the sites of action in a receptive cell, producing physiologic histamine effects." However, "When an antihistamine drug reaches the cell it is thought that because of structural similarity to histamine it re-

* Metreton was supplied by Harry V. Pifer, Jr., M.D., Clinical Research Division, Schering Corporation, Bloomfield, New Jersey.

TABLE 1
RESPONSE OF ANTERIOR SEGMENT OCULAR DISEASE TREATED WITH METRETON OPHTHALMIC SUSPENSION

Condition	Number of Patients	Results	Comments
Blepharitis	115	Symptoms relieved dramatically	Local antibacterials* needed in many cases
Acute meibomitis	46	Edema lessened	Many needed surgery and local antibacterials*
Blepharoconjunctivitis	55	Symptoms improved	Desensitization and antibacterials* required
Allergic conjunctivitis	59	Dramatic improvement in 24-48 hours	
Vernal conjunctivitis	12	Markedly improved in all cases	
Drug sensitivity	9	Successful in all cases	
Phlyctenular conjunctivitis	6	Improved dramatically	
Catarrhal conjunctivitis	56	Markedly improved	Antibacterials* required in half of the cases
Pingueculitis	8	Markedly improved	
Ocular symptoms with asthma, hay fever, etc.	48	Symptoms lessened, chemosis and edema lessened	
Episcleritis	22	Pain subsided and injections lessened	Required systemic Meticorten in almost one half of the cases
Marginal ulcers	5	Dramatic improvement	
Iritis			
nongranulomatous	18	Nongranulomatous improved	Over half the cases required systemic Meticorten and antibacterials*
granulomatous	10	more than the granulomatous	
Surgery			
Major: (cataracts strabismus glaucoma enucleation etc.)	120	Lid and conjunctival edema lessened although subconjunctival hemorrhage tended to persist longer	Less postoperative scarring
Minor: (chalazion pterygium etc.)	132	The same as above	

* Metimyd Ointment with neomycin, aureomycin, terramycin or sodium sulamyd solution (10 percent).

places histamine at the site of action. Supposedly no particular physiologic action then occurs."

These properties apply in clinical practice of ophthalmology and offer dual therapeutic benefits and synergistic action.

CLINICAL STUDIES

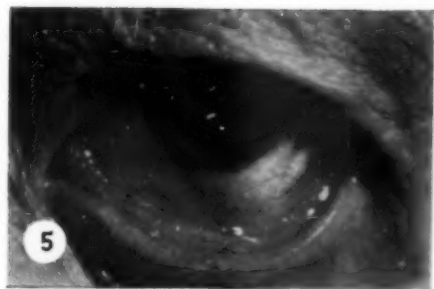
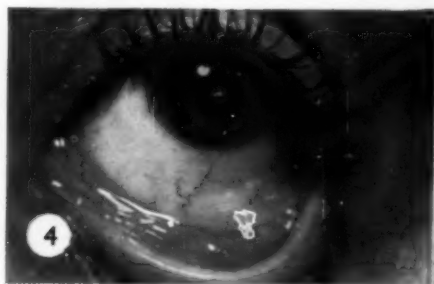
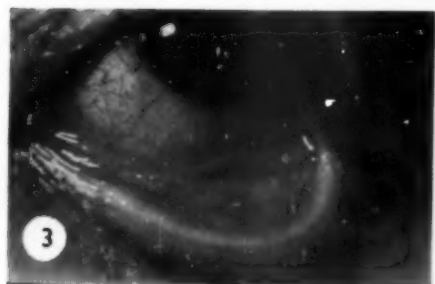
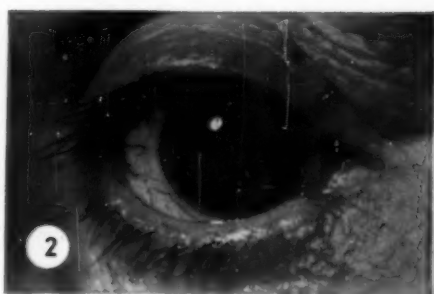
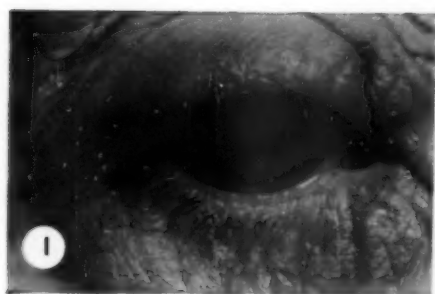
With this in mind, Metreton Ophthalmic Suspension was prescribed for a large variety of anterior segment ocular conditions, including many allergic as well as post-operative eyes.

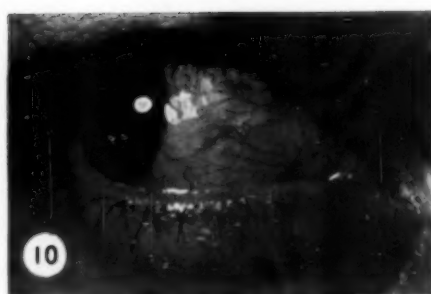
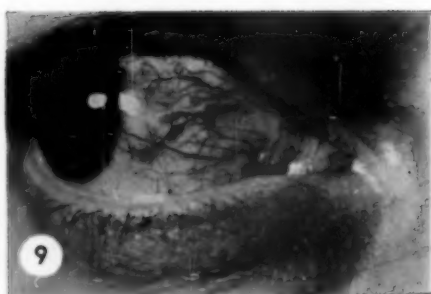
We were particularly impressed by the response obtained in the treatment of symptoms accompanying the seasonal ocular allergies, such as hay fever, asthma, and so forth. It was noted that prompt relief was obtained to such symptoms as lacrimation, burning, itching, and photophobia in a majority of the cases following local topical therapy with Metreton Suspension.

The drug was instilled topically as eye-drops every hour for the first 24 to 48 hours and then every two hours until the condition improved, at which time the drop dosage

TABLE 2
KEY TO FIGURES 1-8

Figure No.	Patient	Diagnosis	Treatment	Before	After (days)
1 and 2	M. O.	Allergic conjunctivitis	Metreton	Fig. 1	2 (fig. 2)
3 and 4	M. C.	Follicular conjunctivitis	Metreton	Fig. 3	7 (fig. 4)
5 and 6	R. S.	Catarrhal conjunctivitis	Metreton	Fig. 5	7 (fig. 6)
7 and 8	J. B.	Drug sensitivity (Dionine)	Metreton	Fig. 7	6 (fig. 8)





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function. They have an unusual property of spreading through bone and causing a marked hyperostosis, a process which is frequent, with involvement of the outer one third of the sphenoidal ridge in the en-plaque type. In addition the tumor tends to insinuate itself into the crevices, cracks, and foramina of the brain and cranial cavity and to become very widespread.

A number of pathologic classifications have been proposed for the tumor. Cushing and Eisenhardt,² whose authoritative monograph is monumental in this field, trace it back to a primitive meningiocyte from that part of the ectoderm giving rise to cell masses on the neural groove and neural crest.

Thus, these tumors are particularly prone to occur near the large venous lacunae of the skull about which arachnoid villi are particularly clustered. Arachnoid villi form the pacchionian bodies which perform functions similar to those of the reticulo-endothelial apparatus in other parts of the body. They have an active fibrocytic role in keeping the cerebrospinal pathway cleared of debris and an important role in the formation of new membranes associated with the reparative intracranial processes.

Globus³ believes that cytologic studies of the meninges are unlikely to reveal the origin of the tumor and directed attention to the phylogenetic and ontogenetic processes which take place in development of the meninges. He traced its origin to the mesenchyme which gives rise to the bone-forming periosteum, the collagen-producing anlage of the dura, the anlage of the epithelial (endothelial or mesothelial) covering of the arachnoid, and the primordium of the pia. Thus these tumors may present a variety of cell types and it is not uncommon to find several cytologic types in different portions of the same tumor.

Bailey and Bucy,⁴ in 1931, classified the tumor into mesenchymatous, angioblastic, meningioendotheliomatous, psammomatous, osteoblastic, fibroblastic, melanoblastic, and lipomatous types. Cushing and Eisenhardt

TABLE 1
AGE DISTRIBUTION OF 143
CASES OF MENINGIOMA

Age (yr.)	No. of Patients
Under 20	9
20-29	7
30-39	28
40-49	39
50-59	43
Over 60	17

presented nine types with variants within each group. Since then it has been recognized that the histologic origin plays a minimal role in prognosis.

Records of patients with histologically verified meningiomas seen at the University of Chicago Clinics are the basis of this report. Excluded from consideration were meningiomas involving the spinal cord and those tumors in which the diagnosis was not based on examination of the tissue. A total of 143 intracranial meningiomas are considered. The age distribution is shown in Table 1. In this series the tumor caused the majority of patients to seek care during the fifth decade. The youngest patient was five years of age and the oldest was 80 years of age.

Meningiomas occur predominantly in females, and in this series 91 females were seen compared to 52 males. Not infrequently the onset of symptoms is initiated by a recent pregnancy, a topic discussed in detail by Weyand, MacCarty, and Wilson⁵ recently. The Negro is not involved as commonly as the white. There is frequent association between trauma to the skull and subsequent meningioma, both as to association with trauma and to location of the tumor.

The location of the tumor in this present series is shown in Table 2. The distribution corresponds closely to that reported by Cushing and Eisenhardt² and Olivecrona.⁶ The tumors that arise from the cranial base slightly exceed in number those that underlie the cranial vault. It must be pointed out that the exact origin of the tumor may be difficult to localize after growth of the meningioma

TABLE 2
ANATOMIC LOCATION OF 143
CASES OF MENINGIOMA

Parasagittal		46
Convexity		35
Frontal	20	
Temporal	6	
Parietal	2	
Occipital	3	
Parieto-occipital	4	
Sphenoidal ridge		15
Tuberculum sellae		14
Olfactory ridge		10
Cerebello-pontine angle		9
Middle and posterior fossa		9
Multiple meningioma		3
Optic nerve sheath		2

and sometimes its probable origin is estimated only by the symptoms produced in its early period.

MENINGIOMAS OF TUBERCULUM SELLAE

Meningiomas of the tuberculum sellae arise from the meningeal covering of the anterior and posterior clinoid processes and the floor of the sella. Their classic presenting signs are bitemporal constriction of the visual fields and unilateral optic atrophy occurring in the absence of demonstrable roentgenographic disease. Because of the intimate association of the optic chiasm to the area, tumors here may cause signs very early in their course. However, the region is crowded with important structures and with moderate increase in size, carotid arteries and cranial nerves are implicated so that removal constitutes a formidable and occasionally insurmountable surgical task.

There have been several recent reviews of the ocular symptomatology of meningiomas of the tuberculum sellae, notably those of Grant and Hedges⁷ (30 cases) and Uihlein and Weyand⁸ (53 cases). Females were involved predominantly, and almost invariably loss of vision with an accompanying field defect was the outstanding symptom. The field defect was occasionally scotomatous but usually peripheral and was associated with an optic atrophy which was usually monocular but sometimes involved both eyes.

Although roentgenographic studies may

indicate no abnormality in the majority of instances, erosion of the clinoids, enlargement of the sella turcica, or a calcified tumor may be demonstrated. It must be emphasized that roentgenographic studies demonstrating a normal skull when combined with optic atrophy by no means exclude the possibility of meningioma as a cause of the symptoms.

Fourteen patients were seen with meningiomas involving the tuberculum sellae. Of this number five were male and nine were female. The patients varied from 29 to 58 years of age with a median age of 42 years. Their outstanding symptom was loss of vision involving one or both eyes arising from primary optic atrophy. Twelve of the 14 patients were seen initially by an ophthalmologist because of ocular symptoms.

Analysis of the field defect at the time the patient was first seen was complicated by the frequency with which one eye was entirely blind before the patient sought care. A homonymous hemianopsia occurred in three patients and a bitemporal hemianopsia in six patients. In five patients vision was so poor in one or both eyes that it could not be determined if the field defect in the better eye represented a heteronymous or homonymous type of involvement. In only one patient was the scotomatous type of field defect found as described by Schlezinger et al.⁹ This subsequently broke through to the periphery to be part of a superior temporal quadrantanopsia.

The extent to which visual defect had progressed in this group of patients when they were first seen is surprising. Eleven of the 14 patients had vision in one or the other eye of less than counting fingers at two feet. One patient was blind in both eyes, and others had vision reduced to finger counting in each eye. Patients had noted failing vision over a period of time ranging from six months to four years.

The optic atrophy seen in these patients, particularly when monocular, must be distinguished from that arising from vascular disease, glaucoma, and tabes. The patients

were of an age group where their ocular symptoms might be attributed to glaucoma or a vascular accident involving the optic nerve or central retinal artery. The normal size of the arteries in the optic atrophy associated with meningioma serves to distinguish it from atrophy due to vascular occlusion. The intraocular pressure is normal and the progress of the field defect is more rapid than that seen in glaucoma. Glaucoma provocative tests are, of course, negative in meningioma. There are no other signs suggesting central nervous system syphilis or other inflammatory causes of optic atrophy. Two patients, both with advanced visual field defects, sought medical attention because of retrobulbar pain, although each had been aware of the visual disturbance prior to the onset of this pain. Two other patients sought care because of divergence of a blind eye, although the decreased vision had not apparently alarmed them.

Two patients had amenorrhea of one year and two years' duration respectively, attributed to involvement of the pituitary gland.

Other than this, the neurologic examination did not contribute to the diagnosis other than in regard to the ocular signs.

Roentgenograms were diagnostic or suggestive of the disease in seven of the 14 patients. Findings included erosion or hyperostosis of the sella turcica, calcification in the tumor itself, displacement of the pineal gland, and decalcification of the posterior clinoids. In five patients, roentgenograms of the skull and optic foramen revealed no abnormality but the tumor was diagnosed by means of contrast radiography.

In two patients in whom roentgenograms of the skull and optic foramen indicated no abnormality and angiography and pneumoencephalography were normal, a definite diagnosis was established only by craniotomy. The high index of suspicion necessary for early treatment of these patients is indicated in the following two case reports.

CASE REPORTS

CASE 1

A 29-year-old Negress was first seen December 10, 1954, complaining of a decrease in vision in the



Fig. 1 (Newell and Beaman). The proptosis of sphenoidal ridge meningioma.



Fig. 2 (Newell and Beaman). The symmetric proptosis of a meningeoma of the optic nerve in Patient 1 when 18 years of age.

left eye which had been first noted 10 months earlier. Examination indicated vision to be: R.E., 20/30, corrected to 20/20; L.E., counting fingers at three feet, unimproved with correction. A marked left optic atrophy was present and there was questionable pallor of the right optic disc. Visual field examination indicated a nasal island of vision remaining on the left side. The right visual field was normal. Roentgenograms of the skull and optic foramina and left carotid angiogram revealed no abnormality. Neurologic examination was normal and, except for the optic atrophy, no other disease could be found.

On December 24, 1954, a right frontal craniotomy was performed by Dr. Joseph P. Evans. A meningeoma of the tuberculum sellae was found which encompassed both optic nerves. The tumor was resected with a minimal postoperative reaction and the patient was discharged two weeks later. When last examined in March, 1955, vision in the left eye was counting fingers at three feet. The right eye was normal. Histologic examination indicated a meningioendotheliomatous meningeoma.

CASE 2

A 57-year-old white man, a farmer, was first seen June 8, 1954, complaining of blurred vision for the previous six years. Vision was: R.E., finger counting at one foot; L.E., 10/200, corrected to 20/30. Examination indicated temporal pallor of each disc, the right more marked than the left. Visual field examination demonstrated an irregular contraction of the visual field of the right eye and a central scotoma of the left eye. Roentgenograms of the skull demonstrated no abnormality. A carotid angiogram and pneumoencephalogram indicated no intracranial disease.

On August 10, 1954, Dr. R. B. Cloward did a right frontal osteoplastic craniotomy and removed a meningeoma the size of a tomato from the tuber-

culum sellae. A small berrylike aneurysm on the superior surface of the left carotid artery was an interesting additional pathologic finding. When seen six months after operation, vision was corrected to: R.E., 20/40; L.E., 20/20. The visual field was full in each eye.

The importance of comprehensive study of a patient presenting signs of optic atrophy even in the presence of normal roentgenograms cannot be overstated. When the visual loss is progressive, diagnosis may require craniotomy even when other neurologic signs are absent and intracranial disease cannot be demonstrated with roentgenograms or contrast studies.

MENINGIOMA OF SPHENOIDAL RIDGE

Kearns and Wagener¹⁰ have recently reviewed the ocular signs in 106 patients with meningeoma of the sphenoidal ridge, of whom 73 presented a disturbance of the eyes as the only or one of the chief complaints. The sphenoidal ridge demarcates the frontal from the middle fossa of the skull and extends laterally from the anterior clinoid process to the pterional region of the cranial vault. It is composed of portions of both the greater and lesser wings of the sphenoid bone and is in intimate association with the orbit, the optic foramen, and the superior orbital fissure.

At the time of operation, it may be difficult for the neurosurgeon to distinguish between



Fig. 3 (Newell and Beaman). Orbital recurrence of the meningeoma in Patient 1 at the age of 33 years.

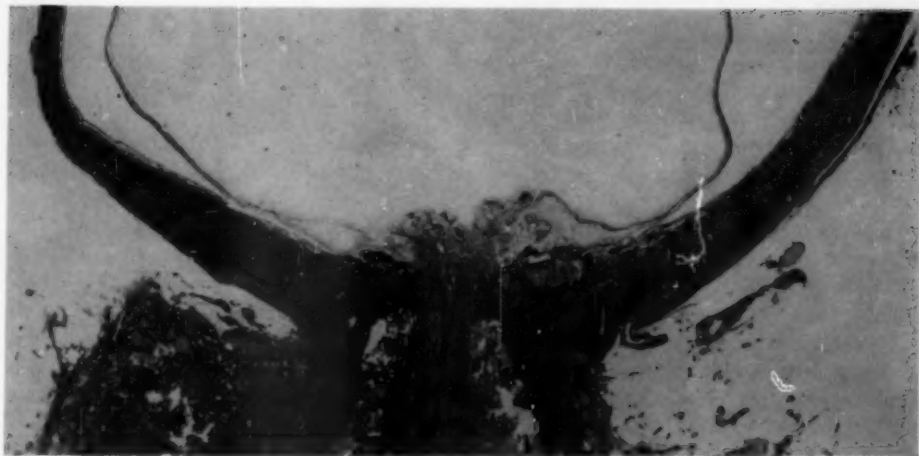


Fig. 4 (Newell and Beaman). Invasion of the choroid and optic nerve by meningioma in Patient 2. (Hematoxylin-eosin, $\times 7$.)



Fig. 5 (Newell and Beaman). Invasion of the optic disc and choroid by meningioma in Patient 2. (Hematoxylin-eosin, $\times 27$.)

tumors originating at the inner one third of the sphenoidal ridge and those arising from the tuberculum sellae or even the olfactory groove. Careful anamnesis and analysis of the ocular symptoms occurring early in the course of the tumor will frequently indicate the probable area of origin.

Cushing and Eisenhardt² found meningiomas of the deep clinoidal one third of the sphenoidal ridge to be characterized by unilateral failure of vision and primary optic atrophy. In eight of 13 cases the eye was blind on admission; in nine patients, proptosis was present. In six patients contralateral papilledema was present and in only three was the contralateral eye normal in all respects. Oculomotor palsies were present in the majority of their patients.

Tumors of the middle sphenoidal ridge may reach a large size without causing symptoms. Their chief ocular sign is bilateral papilledema which is more marked on the side of the tumor.

Tumors of the outer one third of the sphenoidal ridge occur in both en-plaque and global form. The global type expands into the Sylvian fissure; it may remain asymptomatic until quite large, and causes an internal hydrocephalus with bilateral papilledema. This course was followed in 12 of the 13 patients with this tumor in Cushing and Eisenhardt's² series. The en-plaque tumor is prone to cause hyperostosis of the greater wing of the sphenoid with the production of a slowly increasing proptosis with reduction of vision and fullness of the temporal region. In 15 of 16 cases of en-plaque tumors there was exophthalmos. Ten patients had lost vision but only two were blind.

Kearns and Wagener¹⁰ found loss of vision, proptosis, diplopia, pain around one eye, and swelling of the lids to be the chief or one of the main complaints in 73 of 106 patients with sphenoidal ridge meningioma. The remaining 33 patients complained of headaches, convulsions, and mental changes. However, of these 33 patients without ocular complaints, 15 had papilledema, seven had

optic atrophy, three had pupillary signs, and one had a visual field defect. Thus only seven of the group of 106 patients was without eye findings.

In the present group, 15 patients were seen with meningiomas involving the sphenoidal ridge. Of this number, 11 were female and four were male. The patients varied in age from 31 to 57 years with a median age of 41 years. The outstanding symptom was decreased vision in the homolateral eye which occurred in 10 patients. In two patients vision was reduced to light perception in the involved eye and in the others central visual acuity varied from 20/200 to 20/20. Three patients had an homonymous hemianoptic type of field defect. Of the group of 15, 10 had normal contralateral eyes.

Proptosis occurred in eight patients. Of this number two were males, which is a circumstance not observed by Cushing and Eisenhardt² who found the en-plaque tumor of the pterional region exclusively in females. Proptosis was bilateral in one of the patients. All but one of these patients had roentgenographic evidence of an intracranial lesion involving the sphenoidal or orbital region.

Optic atrophy occurred in five patients, in two being bilateral. Papilledema occurred in six patients; in three it was bilateral. In the remaining three patients papilledema occurred on the homolateral sides. Optic atrophy on the homolateral side preceded the development of papilledema in two of the three patients with bilateral swelling of the discs.

Three patients had ophthalmoplegia. It involved the third nerve in two of these patients, one of whom had internal ophthalmoplegia. The remaining patient had involvement of the sixth nerve. Of this group one had proptosis, one had optic atrophy with vision of 20/200 and 20/60, one had papilledema on the homolateral side, and one had vision of 20/200 and 20/20 with homolateral optic atrophy. None of them had involvement of the contralateral eye. These three patients most likely had origin of the

tumor at the clinoidal one third of the sphenoid ridge. The involvement of the motor nerves passing through the superior orbital fissure with resultant ophthalmoplegia surprisingly leads patients to seek care much earlier than when optic nerve involvement causes loss of central vision.

Pain in the eye was a prominent symptom in three patients, each of whom had proptosis and radiologic evidence of a sphenoidal ridge hyperostosis. In two of these patients a homolateral papilledema occurred.

General neurologic signs occurred in seven patients, varying from headache to personality changes. Except for the ocular signs, neurologic examination did not contribute to the diagnosis.

Slowly progressive proptosis occurring in a woman of middle years is the characteristic symptom of sphenoidal ridge meningioma. The proptosis arises not only from hyperostosis of the orbital bones but according to Knudtzon¹¹ may also be attributed to invasive growth into the orbit and congestive changes of the orbital tissue resulting from stasis of the cavernous sinus.

Roentgenographic examination of these patients will assist immeasurably in the diagnosis.

MENINGIOMA EXTENDING ALONG OPTIC NERVE SHEATHS

The optic nerve within the orbit may be involved in a meningioma that originates within the cranium, or at the optic foramen, or within the orbit itself. The chief criteria for orbital origin are that there be no cranial extension and that the proximal stump of the optic nerve adjacent to the optic foramen be normal and have a normal covering. Verhoeff,¹² in 1932, stated that in each of eight cases studied histologically the tumor had invaded the orbit from the cranium. He stated that on a priori grounds there was no reason why such a tumor should not occur but that it had never been demonstrated histologically. Coston¹³ reported a case in 1936 which came closest to fulfilling the cri-

teria for intraorbital origin but was not definitely proven. Friedenwald¹⁴ is credited with describing a case which fulfilled the requirements of orbital origin in 1937, and Craig and Cogela¹⁵ described a single series of 17 cases of intraorbital meningioma, nine arising within the orbit, three from the nerve within the optic foramen, and five apparently from other orbital structures.

The chief symptoms of optic nerve meningioma are decreased vision and proptosis which are slowly progressive. Either may occur without the other. Ocular movements are usually not disturbed. Roentgenographic examination usually indicates a normal optic foramen even though the tumor may extend through it. Intraocular involvement is uncommon but has been reported by Hudson,¹⁶ Coston,¹³ Dunn and Walsh,¹⁷ and Martin and Schofield,¹⁸ Craig and Cogela¹⁵ do not mention this type of involvement although their series is by far the largest in the literature.

Two patients with meningioma extending along the optic nerve sheath were seen in this group. Proptosis was the outstanding symptom in the first and reduction of vision in the second. Because of the paucity of descriptions of this type of involvement the cases are presented in detail.

CASE REPORTS

CASE 1

The patient, aged 18 years, was first seen in October, 1935, complaining of proptosis of the left eye of two and one-half years' duration. Vision was: R.E., 20/15; L.E., 20/40. The Hertel exophthalmometer reading was right, 13 mm. and left, 32 mm. Roentgenographic examination indicated the left orbit to be distinctly larger than the right with its posterior wall more dense on the opposite side. The optic foramina were of equal size.

In December, 1935, the eye was enucleated because of a purulent inflammation of the cornea arising from exposure keratitis. Examination of the enucleated globe indicated a meningioma extending to the globe but not invading the optic nerve itself. The proximal portion of the optic nerve contained tumor cells. The patient was not seen again until 1949, when he was 33 years of age. At this time the tumor involved the roof of the orbit and the lateral wall of the maxillary sinus. Cytologic study of the tumor indicated many mitotic figures and paucity of

fibrous tissue, and it was considered to be a malignant meningioma. Craniotomy and radical sinus surgery failed to remove the tumor completely and he died in 1952, of generalized intracranial involvement.

CASE 2

The second patient was first seen in the Eye Out-patient Section, November 21, 1952, complaining of proptosis of the left eye during the past year. She stated that the eye had become suddenly blind 12 years earlier, and that during the past year it had become increasingly more prominent. Within the past three years, she had three cerebrovascular accidents which were attributed to hypertension.

Examination indicated an orbital mass palpable in the lower fornix of the left orbit. A curdlike elevation of the nervehead four diopters in height was present in the left eye and measured approximately two diopters in diameter. Visual field examination indicated a constriction of the right temporal field. Roentgenographic examination of the left optic foramen indicated it to be larger than the right though within the normal limit of size. There were no neurologic findings other than ocular signs.

A transfrontal craniotomy was performed and a meningioma of the sphenoidal ridge was found, extending back to the pons and anterior to the globe.

The patient died 16 days after the operation. Histologic examination of the globe removed at the time of post-mortem examination showed invasion of the sclera and the choroid by tumor mass. The optic nerve and the meninges about it were infiltrated by tumor cells with extension into the eye at the disc. The retina was invaded about the disc by the neoplasm and showed cystic degeneration at the ora serrata.

The reports of patients with meningioma extending along the optic nerve sheaths together with the findings in these two patients indicate the futility of purely ocular surgery in their management. In the majority of cases it is extremely likely that the tumor has already extended intracranially if it originated intracranially. Since the optic foramen is not always enlarged there may be no indication of intracranial disease. Thus the removal of such tumors is probably the province of the neurosurgeon who can unroof the orbit and inspect the optic foramen. However, the tumor is relatively slow growing and does not metastasize so that in the event of discovery of the true nature of the neoplasm after the usual type of enucleation there has been no great harm to the patient, provided the remaining tumor is removed

if it is evident that excision has been incomplete.

OLFACTORY GROOVE MENINGIOMAS

Olfactory groove meningiomas arise in that area which corresponds to the suture line separating the plane sphenoid and the cribriform plate. With olfactory groove tumors, as well as suprasellar tumors, a disturbance of vision is likely to be the inaugural symptom in each group from quite different causes. A suprasellar meningioma, while still quite small, serves to elevate the chiasm, thereby stretching the decussating fibers and causing bitemporal hemianopsia.

Olfactory groove tumors attain a large size before vision is affected by downward pressure of the nerves and chiasm from above. By that time papilledema and scotomas involve each eye equally.

The olfactory groove meningioma has been described as the chief cause of the so-called Foster Kennedy syndrome, although it seems likely that meningiomas arising from the middle one third of the sphenoid ridge are more frequently at fault. From the location, the initial symptom is a unilateral anosmia. However, tumors may reach quite a large size before patients note an anomaly of their sense of smell.

Ten patients were seen with verified olfactory groove meningiomas. Their occurrence without production of symptoms of any type is indicated by finding the tumor in three of these patients on autopsy following death from quite unrelated disease. None of these three patients had complaints relating to their eyes or any symptoms or findings suggestive of an intracranial neoplasm.

Symptoms presented by the remaining patients related to personality changes in three, headaches in two, loss of smell in two, and convulsive episodes in three. Loss of vision was the chief complaint in only one patient although each of the patients presented ocular signs. The Foster Kennedy syndrome of optic atrophy on one side and contralateral papilledema was seen in only one patient, a

TABLE 3
OCULAR SIGNS IN 143 CASES OF MENINGIOMA

Location	No. of Patients	Diminished Vision	Blindness	Papilloedema	Optic Atrophy	Exophthalmos	Field Defects	Pupillary Signs	Oculomotor Lesions	Nystagmus	Ocular Findings
Olfactory groove	10	8	6	2	7	0	7	7	3	0	1
Optic nerve sheath	2	2	1	1	2	2	1	1	0	0	0
Multiple meningioma	3	1	0	3	1	1	1	2	1	0	0
Cerebellopontine	9	5	0	6	0	0	4	2	1	5	0
Tuberculum sellae	14	13	5	0	11	0	14	7	4	0	0
Sphenoidal ridge	15	11	1	6	4	9	10	2	4	0	1
Parasagittal	46	16	1	13	6	0	12	6	1	0	21
Convexity	35	15	1	23	4	1	20	5	6	0	7
Middle & post fossa	9	5	1	6	2	1	6	2	4	0	0
Total	143	76	16	60	37	14	75	34	24	5	30

55-year-old woman blind in one eye for the previous 27 years. Two patients had bilateral papilledema with good central vision. Each of the remaining patients had bilateral optic atrophy with the defect far more severe on one side than the other. In all but one of the patients, the eye was entirely blind. In the single patient without monocular blindness, vision was reduced to light perception.

The ocular signs observed in these patients are suggestive only of an intracranial tumor rather than being helpful as far as localizing signs are concerned. The associated neurologic symptoms, which are frequently severe, the commonly present roentgenographic findings, and the ocular signs should alert the ophthalmologist to the possibility of severe intracranial disease being present.

Tumors involving the remainder of the brain are not of specific ophthalmologic importance. The commonest type are the parasagittal meningiomas or those tumors which lie at either side of the parasagittal sinus and are adherent to the falx cerebri. If separated by normal cortex they fall into the classification of tumors of the cerebral convexity. These tumors, of course, give rise to ocular signs but largely because of involvement of the optic tracts or ocular muscle nuclei, and interference with ventricular drainage with resultant papilledema. Symptoms and signs of these neoplasms are by no means specific and fall into the general class

of brain tumors. The ocular changes observed in these patients are shown in Table 3. The ocular symptoms vary with the location and size of the tumor and are not characteristic of meningioma.

SUMMARY

A meningioma is a benign connective tissue neoplasm which may arise from the meninges any place in the central nervous system and which, if removed early in its course, may permit return of normal neural function. The records of 143 patients with histologically verified intracranial meningiomas were reviewed with special reference to the ocular signs.

Fourteen patients with meningioma of the tuberculum sellae were seen, 11 of whom had optic atrophy with vision in one or both eyes reduced to less than counting figures at two feet. In two patients roentgenograms of the skull and contrast radiography did not indicate the abnormality but the tumor was found by surgical exposure. It is urged that meningioma be considered a likely cause of the defect in middle-aged patients with progressive optic atrophy not arising from glaucoma, vascular disease, or syphilis.

Meningioma of the sphenoidal ridge was found in 15 patients. Symptoms vary with the portion of the ridge involved but optic atrophy of the homolateral eye and proptosis were the outstanding signs. Roentgen

ray examination will frequently aid in the diagnosis since meningioma of this area, particularly those involving the pterional portion of the sphenoidal ridge, cause a characteristic hyperostosis.

Because of their tendency to insinuate themselves into crevices and foramina in the brain, meningiomas may extend into the orbit along the sheaths of the optic nerve. This causes proptosis, usually with a normal sized optic foramen with no limitation of ocular rotation. Although meningiomas may have their origin from the meningeal sheaths of

the optic nerve, this is so unlikely that it is urged that the neurosurgeon be invited to remove such tumors by means of a craniotomy so that the full extent of the tumor is accessed.

Tumors of the olfactory groove attain a large size before causing visual symptoms. Of 10 patients with meningiomas of this area, the majority had no ocular signs and the visual signs that did occur aided in localizing the tumor in only one instance.

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Groups of these 48 selected cases (16 from the Wright County survey and 32 from the clinics) were utilized for the study of the microscopic, prognostic, therapeutic, and epidemiologic characteristics of trachoma dubium.

LABORATORY STUDIES

An average of two smears each was taken from 10 cases of trachoma dubium and examined microscopically for the presence of trachomatous infection.

THERAPEUTIC TRIALS

The majority of cases of trachoma can be cured by sulfonamide or terramycin therapy. It seemed of interest, therefore, to study the response of a series of patients with trachoma dubium to the agents generally conceded to be efficacious in the therapeutics of classic trachoma. Of the total of 42 cases that could be observed clinically for a period of one year, 14 had received either sulfonamide or terramycin therapy, and 28 were untreated.

EPIDEMIOLOGIC INVESTIGATIONS

In an effort to determine the degree of family association between trachoma dubium and classic trachoma, the households of 16 patients with trachoma dubium were investigated. A total of 89 persons resided in these households and 88 of them were examined. In addition, an elaborate effort was made to uncover any family history of trachoma in each household. The paucity of cases of classic trachoma among school children made it impossible, unfortunately, to obtain similar "secondary attack rate" data by utilizing cases of diagnosed classic trachoma as index cases.

RESULTS

LABORATORY STUDIES

No inclusion bodies or other cytologic changes suggestive of trachomatous infection were revealed by the microscopic examination of the 20 smears from 10 cases of

trachoma dubium. These findings were confirmed by an independent university laboratory.

THERAPEUTIC TRIALS

At the end of one year, six of the 14 cases of trachoma dubium treated for trachoma showed improvement as manifested by disappearance of follicles; the other eight remained unchanged. Of the 28 cases left untreated, 11 showed improvement and 17 remained unchanged. In percentages, 43 percent of the treated group and 39 percent of the untreated group showed improvement at the end of one year. Expressed statistically by means of a chi-square test, there is no difference in the therapeutic responses of the two groups ($P > 0.98$).

EPIDEMIOLOGIC STUDIES

No evidence of active or arrested trachoma was found among the household contacts of the 16 cases of trachoma dubium investigated in Wright County. The one contact not examined had no history suggestive of trachoma. Only one of 16 families gave a positive family history of trachoma: a maternal grandmother, not a member of the household, was reported as trachomatous and the report confirmed by examination of the patient.

DISCUSSION

Smears from at least half of all early trachoma cases can be expected to show intracellular virus inclusions and other characteristic cytologic changes.² The uniformly negative findings in the small series of 20 smears from 10 cases conform to the findings recorded by another observer³ on larger numbers of cases and may be considered as evidence against identifying trachoma dubium with early trachoma.

With respect to the therapeutic trials, it is noteworthy that in recent times workers in Arkansas⁴ have had therapeutic success with better than 98 percent of approximately 8,000 cases of classic trachoma, and that most

authorities^{5,6} now agree that terramycin and the sulfonamides are most effective in treating the disease. In this series the results of the therapeutic trials failed to indicate any similarity between trachoma dubium and classic trachoma in response to therapy, but the possibility of spontaneous cure must be borne in mind. In a series of adult patients this would have little significance but, in children, spontaneous cures of classic trachoma are known to occur frequently, that is, in from 10 percent to 30 percent of cases.

The results of the epidemiologic study offered no support to the hypothesis that trachoma dubium is an early form of classic trachoma. Trachoma in Missouri, as elsewhere, is recognized as a "family disease" with a high prevalence of cases among family contacts of proven cases.⁷ In 1943, Julianelle⁸ reported that there was at least one other case of trachoma in 67 percent of the households of cases investigated in Missouri.

In view of the high secondary attack rate characteristic of trachoma, it is noteworthy that not a single case of trachoma was found among the household contacts of the cases

of trachoma dubium investigated. This again may be interpreted as suggestive evidence that the trachoma dubium of this study was not an early or mild form of trachoma. The history of a trachomatous grandparent among the nonhousehold contacts of one of the 16 cases investigated is not considered significant since over two percent of the population of the Wright County area had trachoma 20 years ago.⁹

SUMMARY

Although the number of cases involved in this study is admittedly small (48), laboratory, clinical, and field studies of follicular conjunctivitis observed in Missouri, and referred to in this report as trachoma dubium, do not in any way support the hypothesis that trachoma dubium is an early or mild form of classic trachoma.

58 Judson Avenue.

I am indebted to Dr. E. A. Belden, Dr. A. Siniscal, Dr. W. Clark, and Dr. Phillips Thygeson for practical advice regarding the conduct of epidemiologic studies in the field, randomization and experimental design, and orientation to the clinical and microscopic manifestations of classic trachoma.

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sudden onset of the experimental trachoma is caused by a massive invasion of viruses at one time (Nataf,⁶ Bietti,⁸ Hassouna,¹⁰ and others). Some experimental evidences obtained by us¹⁰ indicated that the number of infective viruses did not influence the type of onset. A series of dilutions was given and each diluted material (original to 1:1,000) was inoculated in the eyes of human volunteers. In these inoculation experiments, the amount of infective viruses influenced somewhat the length of the incubation period but not at all the type of onset.

In other inoculation experiments, either trachomatous conjunctival tissue or its emulsion was used. The inoculum contained different amounts of viruses. It could be easily shown that the number of inclusion bodies in each inoculum varied widely. If infection occurred, the disease always began with acute or subacute symptoms within three weeks. In unsuccessful infections many subjects, mostly doctors and nurses of our department, have been observed for several years, but no one developed a mild or an insidious form of trachoma.

As to the method of inoculation, several different types were employed. In the simplest method, scraped conjunctival epithelium was directly rubbed into the subjects' eyes. In some experiments, conjunctival emulsions diluted five to 10 times were instilled into the subjects' eyes for a few days. No difference could be recognized in the types of onset between the two methods.

As far as the activity of the virus is concerned, an attempt to reduce its virulence was made. The material was diluted with normal saline and kept in room temperature. Inoculations were made several times a week with this material. In the first two inoculations done within the first three days, positive results were obtained showing no difference in the type of onset. Inoculations performed after the fourth day did not produce the disease.

Kato and Tanaka¹⁷ also reported that even when the trachoma virus was pretreated with terramycin it could produce the disease.

There is no evidence that the degree of activity of the infective virus influences the type of onset of trachoma. The reactivity of an individual, however, seems to make some difference in the intensity of the onset.

BACTERIAL OR VIRAL SUPERINFECTION

The acute intensive conjunctival manifestation in trachoma is possibly produced by a bacterial or viral superinfection in both the early and the late stage of trachoma. This has indeed often been encountered in Egypt. In these circumstances no one can deny the acute onset of trachoma and numerous authors (Thygeson,¹⁸ Bietti,⁸ Aoki,¹¹ and Kunitomo,¹²) recognize an abacterial acute trachoma.

To verify this fact, I have done some additional experiments. Under great care a bacterial or viral superinfection was avoided and four inoculation experiments and five natural acute trachoma cases were observed. In the experiments, the material was obtained from a case of typical chronic trachoma having inclusion bodies and no bacteria. Prior to obtaining the material, bacterial cultures, both for aerobes and anaerobes, were made from the eye of the donor. If the culture was positive, the topical instillation of weak solutions of penicillin, streptomycin, and polymyxin was given until the contaminating micro-organisms had definitely disappeared. In the subject's eye a bacterial contamination was carefully prevented in a similar manner. The onset was acute in all four cases. Bacteriologic examinations were performed several times after the onset of the disease. There appeared nonpathogenic organisms, such as nonhemolytic staphylococcus and corynebacterium xerosis, which were easily taken care of by the application of an appropriate antibiotic.

Of the five patients with natural acute trachoma who visited our clinic from 1955 to 1956, four of them showed an initial trachoma and one a recurrent case with bacterial superinfection in the chronic stage. In the four initial trachoma cases, two were

bacteria free but the two others showed nonhemolytic *Staphylococcus albus* (coagulase test negative). These organisms were sensitive to penicillin and streptomycin and could be removed easily within a few days. The disappearance of these secondary organisms did not influence the manifestations of the acute trachoma. I would like to conclude that trachoma can arise acutely even in the absence of a bacterial superinfection.

The influence of a viral superinfection on the manifestations of trachoma has to be considered separately. Because of the recent increase in the viral forms of acute conjunctivitis and because of the decrease of bacterial infections, this problem becomes more important though little attention has been paid to it so far.

Nataf,^{5,6} who believes in the chronic onset of trachoma, still has some doubts as to the viral superinfection in the early acute trachoma. Careful consideration has been given to this problem in both our experimental and natural trachoma. The most common virus which is capable of producing a superinfection on trachoma is the virus of epidemic keratoconjunctivitis. I experienced an epidemic of this disease during the antitrachoma campaign. The disease occurred accidentally in 42 cases of trachoma patients and in 31 normal persons after the first eye examination. In the patients with trachoma the conjunctival manifestation changed to an acute follicular inflammation with true and pseudofollicles, while in early acute trachoma or in epidemic keratoconjunctivitis the follicular elevation on the conjunctiva usually consists of pseudofollicle. This acute follicular conjunctivitis is very difficult to diagnose.

I attempted to outline the different points of diagnosis between trachoma and epidemic keratoconjunctivitis, singly or together.

1. If the inclusion bodies can be found, the diagnosis of trachoma is certain but this is not enough to exclude the existence of epidemic keratoconjunctivitis. In such cases, if antibiotic treatment with achromycin, aureomycin, or terramycin shows a prompt

improvement of the inflammation, the case is probably one of pure acute trachoma. But if no improvement occurs, superinfection with epidemic keratoconjunctivitis is doubtful. If a superficial punctate keratitis appears, one undoubtedly is dealing with an epidemic keratoconjunctivitis superinfection.

2. If the search for inclusion bodies remains negative, the case is probably one of epidemic keratoconjunctivitis but there may still be some doubts whether acute trachoma is present or not. Repeated examinations for inclusion bodies should be done and several 10,000 of epithelial cells examined. It is certain that, in the primary acute trachoma, the inclusion body is always demonstrable but, in the reinfecting patient, this is not always the case. In such a patient appropriate antibiotic treatment will give some aid in the diagnosis.

For many ophthalmologists a pannus is necessary for diagnosing trachoma even in the early stage; but a pannus cannot be expected in every case of early trachoma. Moreover, an acute inflammatory pannus sometimes appears temporarily in herpetic keratoconjunctivitis, epidemic keratoconjunctivitis, or allergic keratoconjunctivitis. Therefore, the diagnostic value of the pannus is not certain in the primary, early, acute trachoma.

In our experimental trachoma, no case showing superficial punctate keratitis was seen and every case responded to the appropriate antibiotics whenever treatment was required. Mitsui¹⁰ and Aoik²⁰ had the same experience in their tremendous numbers of inoculation experiments.

TYPES OF ONSET IN EXPERIMENTAL TRACHOMA

The manifestation of trachoma at onset can be divided into three forms.

1. ACUTE TYPE (fig. 1)

This means an intensive conjunctival inflammation on both the bulbar and the palpebral conjunctivas with lid edema and pre-

They recommended replacing the term with "insidious." Speaking against this decision, Mitsui claimed that the onset of trachoma is "sudden" with definite inflammation.

From the subjective viewpoint, patients or their parents often overlook the onset of trachoma because of the little attention given to eye diseases. This is often true in the lower classes in Japan. In old Japan, 20 or 30 years ago, trachoma was a common eye condition among the fishermen and other workers and in these villages everybody had dirty or red eyes. This tendency still remains among old people who never complain about a conjunctival disorder or even an acute conjunctivitis until severe ulceration or a sudden viral disturbance occurs. Under these circumstances, the onset of trachoma can be declared "insidious." This, however, does not refer to the true condition in a scientific, medical, or objective sense.

From the objective viewpoint, the onset of trachoma is undoubtedly sudden with a definite acute exudate inflammation which appears clinically as an acute or as a subacute disease.

CLASSIFICATION OF TRACHOMA

MacCallan's classification or its modification by the World Health Organization, presently widely used all over the world, is very convenient for the classification of chronic trachoma but inconsistent in the early stage. According to this classification, most of the early cases of trachoma, and especially the onset, may be overlooked and misdiagnosed. In one of MacCallan's articles,²² the first stage of trachoma was defined:

"The first stage is the earliest sign of uncomplicated trachoma. The pathologic appearances are slight and are easily missed by one who has not a large experience of the disease, though any careful observer may detect them. One finds scattered on the conjunctiva of the upper tarsus a few slight roughnesses, forming tiny grayish islets, which are semitransparent and almost avascular. The rest of the conjunctiva may show

no sign of inflammation, and there may be no conjunctival discharge or other inconvenience."

This type of early trachoma is very rare in bacteriologically proven cases. I have found this type of onset only in reinfecting cases. Most of the early stages of trachoma appear similar to the manifestations of Trachoma II, even at the beginning. Mitsui²³ first noticed this fact and many agree with him.

From the virologic viewpoint, most of the previous classifications should be reconsidered and changed, especially those concerned with the early stage. MacCallan's classification has been used in Egypt since 1906, one year before the discovery of the Prowazek-Halberstaedter inclusion body. Very little attention has been paid to these inclusion bodies in this classification.

The numbering system classifying a certain stage of trachoma is a useful idea and should be continued. I should like to advocate a description of the types of onset added to the stage number, like Trachoma I acute or Trachoma I subacute. Each manifestation should be written following the World Health Organization system, but some addition of symbols to differentiate follicle (F) and pseudofollicle (psF) is necessary. In early trachoma, the follicular elevation on the conjunctiva is proved on slitlamp examination to be pseudofollicular. If the disease lasts for at least a few months, the vascular picture on the follicular elevation gradually changes to that of a true follicle. This is the complete trachoma and the stage may be Trachoma II. The manifestations of trachoma in the first stage have already been mentioned under "Types of onset." The nature of the inflammation in the second stage gradually changes to a chronic productive type.

CONCLUSION

It is my opinion that trachoma starts as an acute or subacute clinical disease with a definite acute exudative inflammation in both the experimental and the natural cases. A

DISSEMINATED PIGMENTARY DEPOSITS*

IN MELANOBLASTOMA OF THE CHOROID

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In a publication which failed to attract the attention it deserved, Zeeman (1931) described as "taches noirâtres" the dark gray pigmentations at a considerable distance from a tumor in an apparently normal area of the retina. One of the two cases he cites is illustrated in Figure 1. Zeeman also presented the pathology and considered that for the greater part the disseminated cells originated from the pigment epithelium over the site of the tumor. He added that "they are distinctly different from the physiologic tabulated pigmentations of the choroid which are more sharply marked off and characterized by their shape. The blue-gray melanoma of the choroid, slightly prominent, has a quite different aspect and the 'melanoma' of the pigmented epithelium and 'nevroid pigmentation' of the retina are much darker, sharply marked off, and recognizable as such. They resemble tiny pigmentations in the neighborhood of fresh foci of choroiditis."

In 1949, Samuels drew attention to another peculiarity in the pathology of melanoblastoma: the slitlike detachment. Salzmann and Fuchs had previously described slitlike detachments and detachments at the ora serrata.

According to Samuels: "In a given case of combined minimal detachment of the retina and detachment at the ora serrata, frontal and serial sections might have proved the existence of a single, continuous, thin sheet of serous fluid that had spread out from the primary fluid at the site of the tumor. . . . At all events, the fact that the fluid, whether

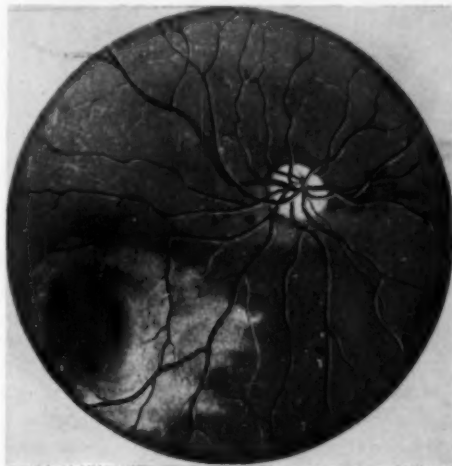


Fig. 1 (Hagedoorn and Salim). "Taches noirâtres" (Zeeman). (*Ann. ocul.*, 168:337, 1931.)

in a minimal retinal cavity or in a cavity in the ora serrata, took exactly the same stain as it did adjacent to the tumor speaks in favor of it being one continuous body."

In this latter conclusion Samuels refers to his observation that the fluid found in the slitlike detachment was different from the fluid in ordinary primary detachment. In the stained specimens it had taken a deep-pink color from its albuminous contents. (fig. 2).

In our laboratory in Amsterdam, Mr. G. Lammens, our technician, drew attention to the fact that, after ordinary fixation with formalin, this albuminous fluid is often transformed into a solid celloidinlike mass in globes with a melanoblastoma (fig. 3).

Samuels also noted that cellular elements are not infrequently seen in the subretinal fluid but he did not discuss the importance of this finding for ophthalmoscopy.

* From the University Eye Hospital, Wilhelmina Gasthuis, Amsterdam, and the University Eye Hospital, Djakarta. This study was supported by the Blaauw Fund.

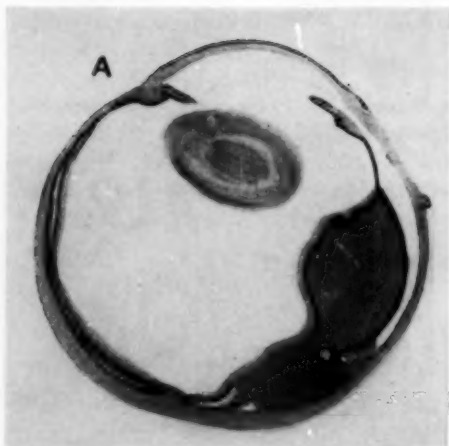


Fig. 2 (Hagedoorn and Salim). (Right) Tumor and albuminous exudate. (Left) Slitlike detachment. (Samuels: *Arch. Ophthalm.*, 42:620, 1949.)

The mechanism of the development of the slitlike detachments remarked by Samuels furnishes the clue to an understanding of the location of Zeeman's "taches noirâtres" in apparently normal regions of the fundus at a distance from the tumor. Proliferation, desquamation, and degeneration of the pigment epithelium may be found in many pathologic conditions. Its combination with the characteristic slitlike detachment of the retina by spreading albuminous fluid which may be subsequently resorbed, however, leads to a characteristic clinical picture. This has been confirmed in many patients, some of whom will be described here.

In Case 1 of Fry and McDonald (1957) a pink-staining exudate (Samuels) was present in the macular region together with disseminated pigmentary deposits (fig. 3, Fry and McDonald). This suggests that the macular disturbance was due to the toxic influence of the subretinal fluid originating from the region of the tumor. A pathogenesis, as suggested by Fry and McDonald and Klien, may be valid for other cases.

We also saw a case in which a severe macular disturbance was the initial sign of a malignant melanoma of the peripheral chorioid.



Fig. 3 (Hagedoorn and Salim). Solidified subretinal exudate after fixation with formalin (Lamens). (Right) Artificial detachment of the retina due to fixation. (Left) Tumor near ciliary body. Solid homogenous mass between retina and choroid (solidified subretinal exudate), extending from the tumor to close to the optic nerve.

CASE REPORTS

CASE 1

Mr. W., aged 59 years. In this case the "taches" might easily have escaped attention or not have

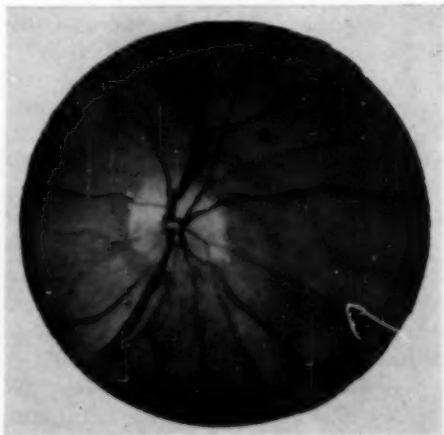


Fig. 4 (Hagedoorn and Salim). Case 1. To the right and superior to the disc are two typical "taches," a larger and a smaller one. To the left and inferior to the disc is a small and intensely pigmented dot.

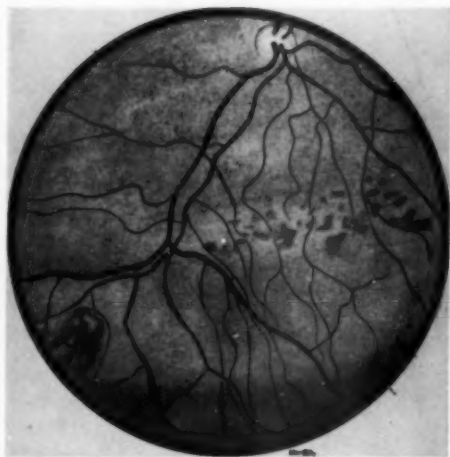


Fig. 5 (Hagedoorn and Salim). *Case 2.* "Taches noirâtres" (Zeeman).

been recognized as such (fig. 4). To the right and superior to the disc there is a larger and a smaller, typical "tache" (Zeeman). To the left and inferior to the disc the dot is small and more intensely pigmented.

CASE 2

Mr. R., aged 65 years, had a large tumor in the temporal region, a slight detachment of the retina in the upper half of the fundus, and "taches noirâtres" as illustrated in Figure 5. The pathology of the case showed a tumor of the epitheloid type of melanoblastoma originating from the ciliary region. The deposits were found at a place where the retina was separated from the pigment epithelium only by



Fig. 7 (Hagedoorn and Salim). Disseminated pigmentary deposits at the right side of the disc extending between the artery and vein, bending downward under the vein and further to the right and downward.

a tiny sheet of albuminous exudate. Consequently, Figure 6 may be regarded as representing the typical anatomic substrate of the disseminated pigmentary deposits in their most characteristic appearance (Zeeman's taches noirâtres) seen in an apparently normal area of the retina.

CASE 3

G. In this patient's slightly albinotic fundus the band of pigmentations was easily recognizable at the nasal side of the disc (fig. 7). Figure 8 gives the pathologic findings in the macular region. A

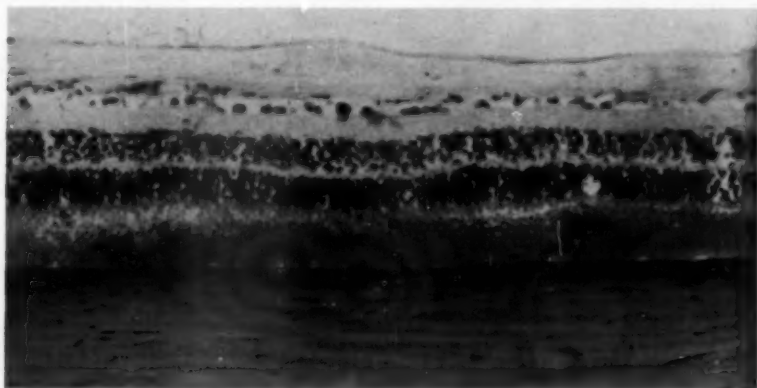


Fig. 6 (Hagedoorn and Salim). *Case 2.* Typical pathologic picture of disseminated pigmentary deposits "taches noirâtres." The sensory elements of the retina are destroyed. There are conglomerations of pigmented cells in an albuminous subretinal exudate.

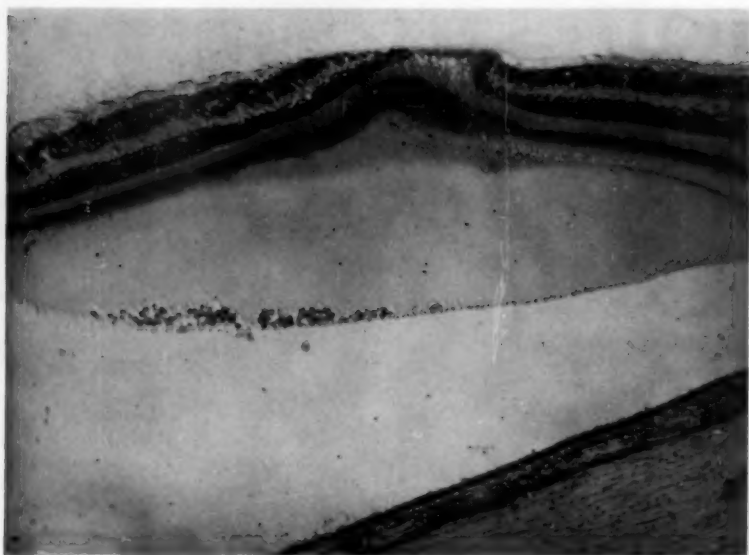


Fig. 8 (Hagedoorn and Salim). *Case 3*. At the macular region, under the retina, is albuminous exudate. Clustered at the base of the exudate are pigmented cells. Between the exudate and pigment epithelium (choroid) there is an artificial cleft due to shrinking after fixation with formalin.

similar pigmentation of the macular region has already been described by Zeeman in one of his two cases. Consequently, slight pigmentation in the macular area in cases suspected of melanoblastoma must be regarded with suspicion.

In this case the sense elements were relatively well preserved, whereas in Figure 6 they had almost completely vanished, probably a more toxic influence of the subretinal fluid. Samuels had already pointed

out that this might be expected to give visual field disturbances on clinical investigation.

CASE 4

H., a woman, aged 63 years. The diagnosis of melanoblastoma in this patient presented some difficulties. A scarcely detectable flat detachment was seen in the superior half of the fundus and a slightly more prominent detachment in the inferior half. No hole or tear was found. There was an area under the disc whose massive aspect led us to think of melanoblastoma. Transillumination yielded no conclusive evidence. Pronounced pigmentary deposits which supported the diagnosis were seen and the eye was enucleated (fig. 9). These deposits were more coarse, irregular, and densely pigmented than the "taches noirâtres" of Zeeman and did not fit his description. They demonstrate that disseminated pigmentary deposits of various size, shape, and intensity of pigmentation may occur in melanoblastoma, though the typical "taches noirâtres" is the most reliable sign.

The pathologic review of the case explains the difficulties in arriving at the clinical diagnosis. Figure 10 shows the flat detachment in the upper half of the retina and the extensive flat melanoblastoma in the inferior half. The subretinal fluid in this case stained intensively and is well illustrated in the photograph.

CASE 5

Mr. L., aged 71 years, refused enucleation and was lost to follow-up. There seems little reason,

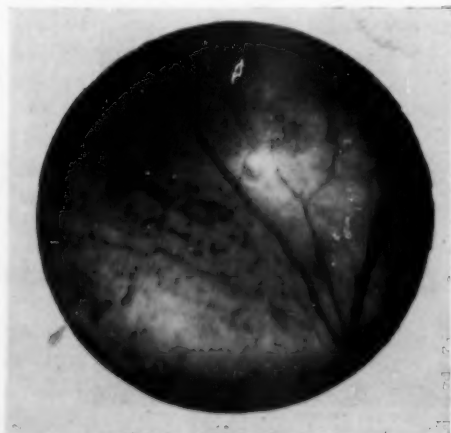


Fig. 9 (Hagedoorn and Salim). *Case 4*. Disseminated pigmentary deposits.

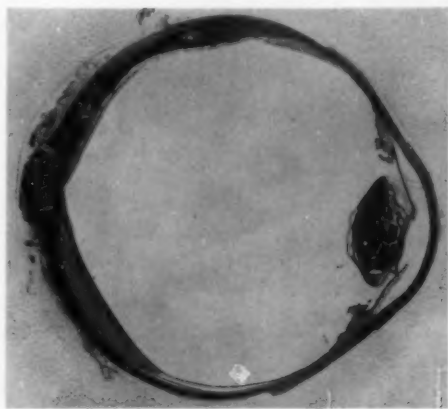
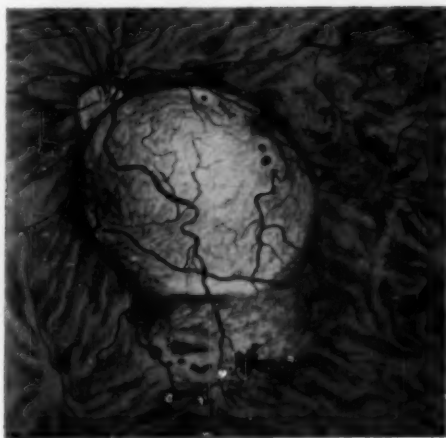


Fig. 10 (Hagedoorn and Salim). *Case 4.* (Above) Flat melanoblastoma. (Below) Albuminous subretinal exudate.



however, to doubt the diagnosis of melanoblastoma (fig. 11). The case is presented here because of the instructive aspect of the fundus. Below, a slitlike detachment of the retina is seen under the tumor and the pigmentary deposits following the stream of fluid have halted, with the normal retina at the border. To the right pigmentary deposits are seen in an apparently normal retina. They are less delicate than the "taches" described by Zeeman. It seems probable that they arrived here in the same way, that the subretinal fluid withdrew or was reabsorbed later, leaving the clusters of pigmented cells under an apparently normal retina.

CASE 6

Mr. S., aged 46 years. Some of the coarser pigmentations suggested the pigmentations seen after a healed metastasis of mammary carcinoma following radiation. A few, however, were smaller and less intensive, resembling "taches noires." Nevertheless a considerable time elapsed before enucleation was performed (fig. 12). A short summary of the same history may be of interest:

The patient was referred to the University Eye Hospital on February 24, 1947. On February 22nd he had consulted his ophthalmologist because of redness and failing sight in the left eye. Up to five days before that he had not been conscious of anything abnormal.

The right eye was normal, emmetropic, with normal vision.

The left eye showed deep pericorneal redness. Behind the lens a mass with a smooth surface and a red tinge in the temporal area was seen. It was noted that in transillumination no definite shadow was observed, the eye being apparently translucent everywhere. It was further noted that the wife of

the patient had been infected with syphilis and that their child had suffered from congenital syphilis. Nevertheless, the ophthalmologist suspected melanoblastoma although the translucency of the tumor made this diagnosis seem doubtful.

On examination in the out-patient department, a flare was found in the anterior chamber, a slightly hyperemic iris, and posterior synechia. The detachment was smooth, without folds, as though the retina were under tension. With transillumination a slight lack of translucency made an inflammatory proliferation of tissue (in addition to a hemorrhage) or a tumor highly probable. The iritis was

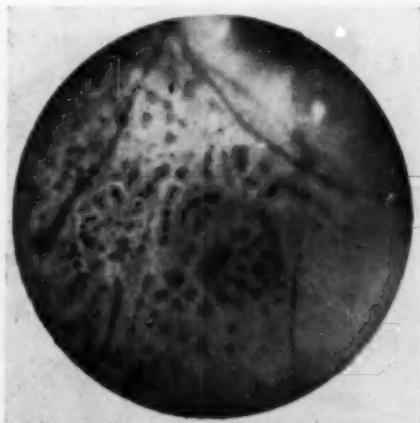


Fig. 12 (Hagedoorn and Salim). *Case 6.* More intense pigmentation in a case with severe necrosis.

regarded as a result either of the infection or of the toxic influence of a tumor. In view of the possibility of a subretinal hemorrhage or tissue proliferation of syphilitic origin, antiluetic treatment was given.

On March 31, 1947, the patient was seen again. The tests for syphilis had been repeatedly negative. Even before the first bismuth and salversan injections the detachment had become flatter. In the superior half of the fundus a large and definitely prominent mass with pigmentations and hemorrhages was seen. Antiluetic treatment was continued, though again the tests were negative.

When the patient was seen again on October 8, 1947, a small mushroomlike proliferation with a hemorrhage was observed, suggesting a perforation of Bruch's membrane and the retina by a malignant melanoma. A diagnosis of necrosis of a tumor with a secondary detachment, together with irritation and the formation of connective tissue, was made and enucleation performed.

In the inferior half of this fundus, pigmentations such as those following the reattachment of a detached retina were seen. Some of the coarse pigmentations recalled the pigmentations seen after a healed metastasis of a mammary carcinoma following radiation but some of them were smaller and lighter, resembling "taches noirâtres."

On pathologic examination a highly vascular and partially necrotic melanoblastoma was found. Typical areas of palissaded spindle cells alternated with necrotic tissue and secondary proliferations of pigmented and nonpigmented cells. Unidentified pigmented and nonpigmented cells were numerous under the retina and newly formed connective tissue was seen.

In this case the toxic influence of the necrotic tumor led to a generalized and pronounced retinal

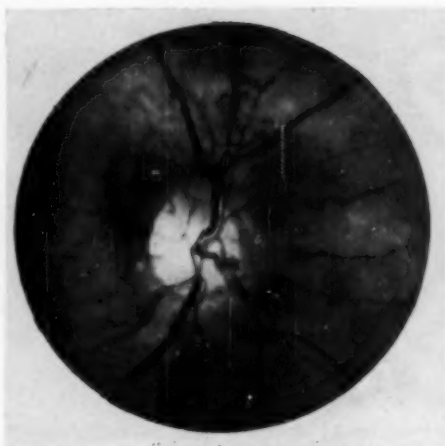


Fig. 13 (Hagedoorn and Salim). *Case 7.* Disseminated pigmentary deposits superior to the disc.

detachment and desquamation of cells of the pigmented epithelium. It was not possible to differentiate these cells from the cells perhaps originating from the necrotic tumor which had perforated Bruch's membrane. This case demonstrates that extensive pigmentations may occur in melanoblastoma with severe necrosis.

CASE 7

V., a 58-year-old woman, had noticed a shadow in the visual field at the nasal side for six weeks. Vision was: 1.0. A flat detachment was seen in the temporal region without a rupture. There

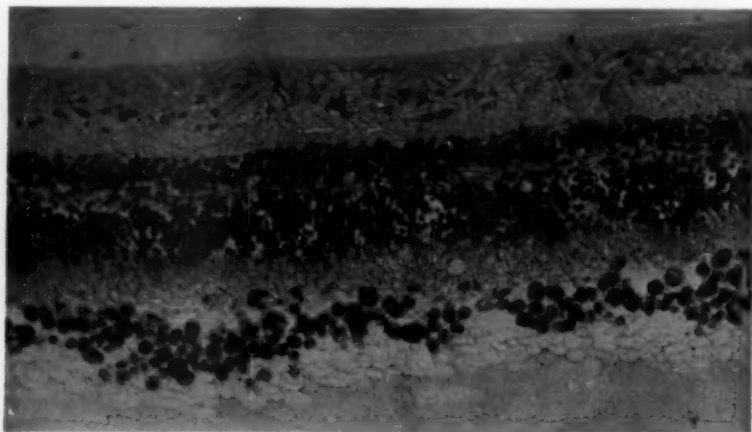


Fig. 14 (Hagedoorn and Salim). Desquamated pigment epithelial cells under the retina which has been detached by fixation with formalin.

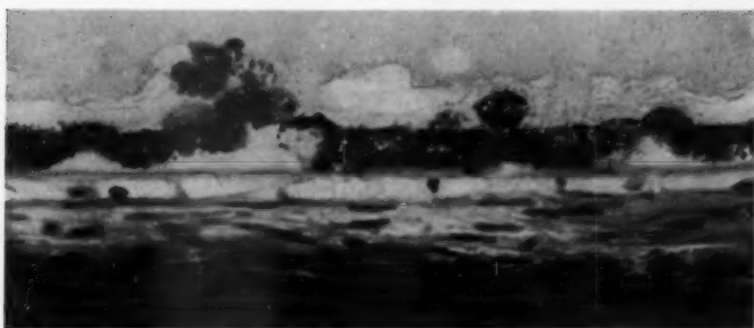


Fig. 15 (Hagedoorn and Salim). *Case 5.* Desquamation of cells of the pigment epithelium in the neighborhood of the tumor.

were typical disseminated pigmentary deposits near the disc (fig. 13) and a distinct shadow on transillumination. The eye was enucleated and the diagnosis was confirmed by the pathologic examination (fig. 14).

CASE 8

D., a woman, aged 49 years. The aspect of the "taches noirâtres" was characteristic. Since the patient had suffered from cancer of the breast, however, and a diagnosis of metastatic mammary carcinoma seemed far more probable, enucleation was postponed. The diagnosis of mammary carcinoma was fully confirmed by pathologic examination after resection of the mamma. The diagnosis of melanoblastoma was confirmed after enucleation of the eye.

COMMENT

The disseminated pigmentary deposits described in this paper originate from the pigment epithelium. In Figure 15 an area is

pictured in which the choroid is still apparently normal. Nevertheless the toxic influence of the tumor is evident from the tendency to proliferation and desquamation of the pigment epithelial cells. This phenomenon, however, is not specific for melanoblastoma. Clusters of such cells may be seen in the subretinal space in eyes enucleated after trauma. In the region directly over the tumor severe degenerative changes are found in the pigment cells, even though the choriocapillary layer still seems to be fairly normally preserved (fig. 16). These enlarge and swell to many times their original size. Desquamated clusters of these cells are seen in the subretinal space in Figure 17. Similar degenerated pigmented cells may, however,

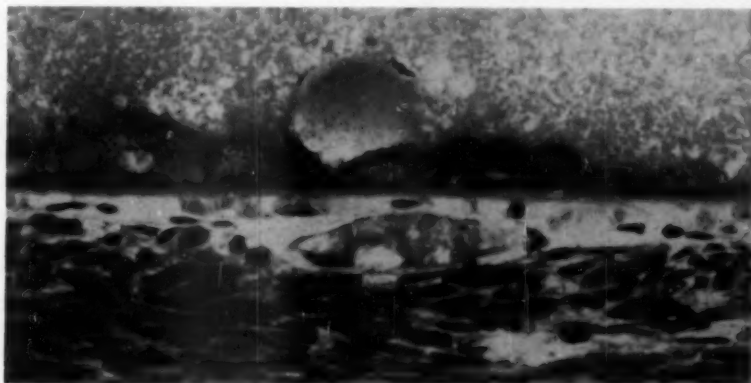


Fig. 16 (Hagedoorn and Salim). *Case 5.* Degeneration of pigmented epithelium over the tumor. The capillary layer of the choroid can still be recognized.

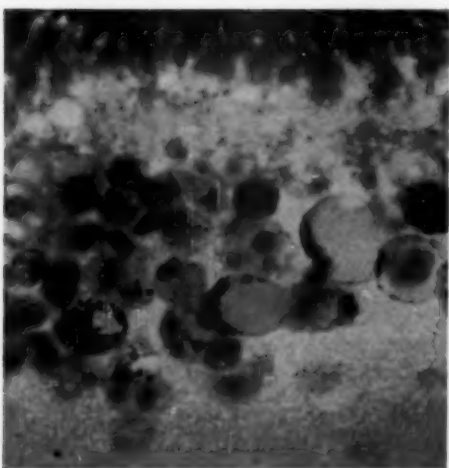


Fig. 17 (Hagedoorn and Salim). *Case 4.* Several stages of degeneration of desquamated cells of pigment epithelium.

be seen in other conditions. We found these cells in a rare case of subretinal hematoma in which the eye had been enucleated.

It is obvious and well known that the proliferation of pigment cells without desquamation over the tumor and transportation by the subretinal fluid to a more peripheral area is frequent. This will lead to pigmen-

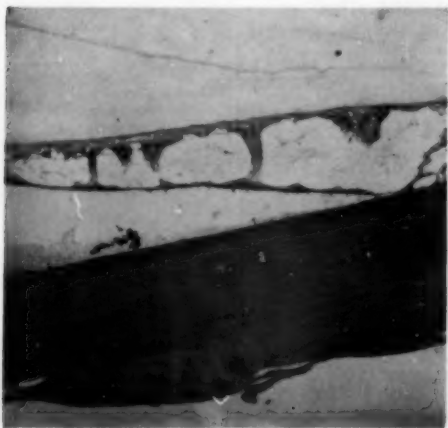


Fig. 18 (Hagedoorn and Salim). Region of the ora serrata. Artificial detachment of the retina by fixation in formalin. To the left may be seen a trace of albuminous exudate and a group of pigment cells.

tions detectable by ophthalmoscopy in the region of the tumor.

In advanced cases of melanoblastoma with necrosis and perforation of Bruch's membrane, it is probable that tumor cells share in the extensive pigmentations seen with the ophthalmoscope. From the foregoing it is clear that in aspiration of the subretinal fluid (Christensen and Rowen) it may be expected that mainly degenerated pigment epithelium cells will be found.

Our cases support the view that the pigmented deposits are transported by fluid that spreads from the tumor to other regions of the eye (Samuels). In Figure 18 (Case 3) it is seen that the desquamated pigment cells even reach the ora serrata, pushed to this remote region by the current of subretinal fluid. According to Samuels the source of the fluid lies in the dilated and engorged vessels of the choroid at the base of the tumor; the tumor itself may contribute to the toxic element. Our specimens suggest that by their disintegration products the pigment cells might also contribute to the peculiar chemistry of the fluid.

Though desquamated and degenerated pigment cells may not be considered specific for melanoblastoma, a fairly characteristic clinical picture is due to phenomena occurring simultaneously in melanoblastoma:

1. The production of an albuminous fluid at the site of the tumor which spreads along a slitlike detachment over the fundus and also toward the ora serrata.
2. The proliferation and desquamation of cells of the pigment epithelium, mainly over the tumor.
3. The spreading of these cells all over the fundus, together with the stream of the albuminous fluid.
4. The resorption of this fluid in certain areas of the fundus or its partial resorption so that the detachment cannot be recognized as such in ophthalmoscopy and the deposits are seen in an apparently normal area of the fundus.

There may be some cases that require addi-

tional evidence to justify enucleation. An examination of the subretinal fluid in a region where no tumor is likely to be expected could be made. In the absence of inflammatory cells disseminated pigment cells might support the diagnosis. It is, however, hazardous to try to identify tumor cells, which are often definitely absent in melanoblastoma. It seems more promising to analyze the chemical makeup of the subretinal fluid, as has been done for the subretinal fluid in ordinary detachment. On our part we feel that a diagnostic puncture in the substance of the tumor—which is difficult to avoid—in order to find the tumor cells themselves might increase the already great danger of metastasis and is not justified. Furthermore, Samuels indicated the possibility that a more careful plotting of the visual field might give further evidence. A knowledge of the

pathology of these cases may be of considerable aid in the correct interpretation of the ophthalmoscopic findings.

SUMMARY

In melanoblastoma of the choroid a diagnostic sign is found in disseminated pigmentary deposits—"taches noirâtres" (Zeeman)—in an ophthalmoscopically normal area of the retina. These are transported by the stream of albuminous exudate (Samuels) emerging from the region of the tumor. This fluid may cause a slitlike detachment too delicate to be observed by ordinary ophthalmoscopy. Probably this fluid may also withdraw or be resorbed, leaving the pigmentary deposits in an apparently normal part of the fundus.

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THE VITREOUS FACE FOLLOWING INTRACAPSULAR EXTRACTION*

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We generally consider the cataract operation successful when the lens is extracted in the capsule without loss of vitreous. Yet there are several complications which have to be attributed only to this type of operation due to the exposed vitreous face. Complications arising from this condition are discussed in the papers of Vannas,¹ Knapp,² Reese,³ Leahey,⁴ Harrington,⁵ S. Rodman Irvine,⁶ and Kirsch and Steinman.⁷

When an aphakic eye is examined with the slitlamp, various conditions of the vitreous face can be observed. There is a well-defined

hyaloid membrane in the majority of eyes. It is either in the plane of the iris, or more often bulging forward mushroomlike into the anterior chamber, called herniation of the vitreous. The vitreous hernia may even reach the cornea. In other eyes the membrane is not intact, shows small or large round or oval holes or rents, or even may be entirely missing. In this case, the vitreous is watery with a few threads, or it is gelatinous and prolapsed in the anterior chamber. This may be called intraocular prolapse of the vitreous.

PRESENT STUDY

This study, based on observations on 420 eyes, was made because of the scarcity of

* Read at the meeting of the EENT Section, Vancouver Medical Association, December 12, 1956.

articles dealing with complications caused by the exposed vitreous face after smooth intracapsular extraction. The technique consisted of two preplaced 6-0 silk corneoscleral sutures, and a knife section, which included a limbus-based conjunctival flap. Peripheral iridectomy was done in 291, full iridectomy in 129 eyes. The lens was caught with the capsule forceps, and in patients past the age of 70 years, the lens was extracted with the sliding method. In almost all persons younger than 70 years, the lens was tumbled.

In order to find out what happens to the vitreous face immediately after extraction and how it has changed after six to 12 weeks, 74 persons were examined. At the end of the operation after the sutures were tied, the eye was observed with a hand slitlamp. In 36 eyes the chamber was flat. In 21 there was a shallow anterior chamber, optically empty, with no vitreous discernible. In 11 there was a vitreous hernia through the pupil. In one the vitreous face was broken, and in five gelatinous vitreous filled the anterior chamber. After six to 12 weeks fol-

lowing surgery the vitreous face was not intact in 10 eyes. In six the chamber was filled with gelatinous vitreous, in two the vitreous was adherent to the wound, posteriorly, and in two the vitreous face was broken without much vitreous prolapse (table 1).

Does the vitreous face change months and years after surgery? Eyes were examined six to 12 weeks after surgery and again three or more years following surgery. There were 33 such eyes. Eight of them already had a broken hyaloid face. Two of these eight had a large gelatinous vitreous prolapse after three years. Of the remaining 25 which had an intact hyaloid face, three developed a break or hole in the face and three had the chamber more or less filled with gelatinous vitreous three or more years later.

When the aphakic persons were grouped according to age at the time when the vitreous face was examined by slitlamp regardless how long after surgery, the percentages of broken vitreous face and prolapsed vitreous increased gradually. It was 15, 18, 22, and 39 percent in the sixth, seventh, eighth,

TABLE 1
CONDITION OF THE ANTERIOR CHAMBER AND OF THE VITREOUS FACE AT THE END OF SURGERY,
AND CONDITION OF THE VITREOUS FACE SIX TO TWELVE WEEKS LATER

Condition after sutures were tied	Number of Eyes	Six to twelve weeks after surgery this changed to:					
		Vitreous Face in the Pupilary Plane	Vitreous Hernia Less than Half of Depth of Chamber	Vitreous Hernia More than Half of Depth of Chamber	Broken Vitreous Face	Gelatinous Vitreous prolapsed and Reaching the Cornea	Vitreous Adherent to Wound
Flat chamber, condition of vitreous face could not be determined	36	6	21	7		1	1
Chamber restored. Shallow. No vitreous in chamber	21	4	10	3	1	3	
Vitreous hernia	11	2	7	2			
Broken vitreous face	1		1				
Chamber filled with gelatinous vitreous	5	1			1	2	1
	74	13	39	12	2	6	2

and ninth decades, respectively. This indicates that destruction of the hyaloid membrane, whether it is only a small area or a whole face, progresses with age. This is not in full accord with Irvine's finding that there was no evidence that rupture of the hyaloid increases significantly with age.

COMPLICATIONS DUE TO VITREOUS

From data compiled from the literature and from my experience, the following complications due to the vitreous may arise postoperatively after smooth uneventful intracapsular operation of uncomplicated cataracts:

A. IN PRESENCE OF INTACT HYALOID MEMBRANE

1. *Pupillary block glaucoma*, according to Chandler, occurs when the iris encroaches on the herniated vitreous in such a manner that the aqueous flow from the posterior to the anterior chamber is prevented. In my series of approximately 1,000 extractions there was not such a case of secondary glaucoma except in one eye. In this, however, the vitreous was attached to the corneal wound so that this vitreous actually presented a solid obstacle against the iris. When the pupil contracted, the iris closed tightly against it and the tension increased. Harrington states that he encountered pupillary block glaucoma only in eyes with annular posterior synechia to the vitreous face.

2. *Thickening of the membrane from unknown cause* was described by Knapp and Reese. In my experience and in accordance with Harrington this occurred only after iridocyclitis or when the vitreous was adherent to the wound. This latter condition will be discussed later. Harrington mentioned that Dr. Howard Mallek noticed this occurrence in two eyes of the same person after uncomplicated intracapsular extraction. He also cites two of his cases and one of Dunnington.

3. *Contact of the vitreous face with the cornea* causing slight discomfort, lacrima-

tion, and photophobia. This, according to Reese, may occur years after surgery and may regress spontaneously or may become permanent. "These eyes usually show vitreous opacities and other indications of a very mild iridocyclitis which has apparently occurred as the result of the herniated membrane. Secondary glaucoma may ensue. If the hyaloid membrane does not retract . . . a permanent corneal opacity develops." Reese also states that the condition of the endothelium is an important factor in the corneal changes. "When the membrane is permanently adherent to the corneal surface the membrane may become thicker and denser adjacent to the site of the adhesion."

In my series of 420 cases examined for the vitreous face postoperatively there were 30 eyes in which the vitreous prolapsed so far as to reach the cornea but without being adherent to the wound. In 10 the hyaloid membrane probably was not broken. However after intraocular prolapse, a new hyaloid membrane(?) or just condensation of the vitreous surface may form to assume the picture of vitreous herniation. Therefore, unless the vitreous face is observed with the slitlamp periodically, it is not possible to tell whether vitreous prolapse or just herniation was present previously. In none of the 30 eyes was damage to the cornea observed but there was one with glaucoma and one with detached retina. Both the eye with glaucoma and the one with detached retina had a broken vitreous face. There was a full iridectomy in the eye with glaucoma, which rules out a vitreous-block glaucoma. Further, the other eye of this patient had elevated tension. This would suggest primary glaucoma. I am in doubt as to whether vitreous may become adherent to an undamaged normal endothelium. It certainly becomes adherent to a damaged one. I saw several eyes with a small vitreous thread attached to the cornea following discission. Rodman Irvine has illustrations of vitreous threads attached to the posterior surface of the wound after uncomplicated extractions.

B. COMPLICATIONS WHEN HYALOID MEMBRANE IS RUPTURED OR ABSENT

1. *The prolapsed or free vitreous*—at least that in the anterior chamber—is often slightly opaque in the beam of the slitlamp. This usually does not cut down the vision as stated by Knapp, though one has the impression that the prepupillary vitreous is cloudy. In other eyes this cloudiness may be the cause of a slightly decreased, 20/25 to 20/30, vision.

2. *Adhesion of the vitreous to the wound* followed by a crease or notch in the pupil and sometimes also by ectropion of the uvea. I don't know whether the intact membrane can stretch so far as to reach the wound in the absence of an iris coloboma. But an irregular pupil, that is a creased iris, is almost always the result of vitreous adhesion to the wound posteriorly. Vannas observed several eyes in which the iris crease was caused by a remnant of the embryonic pupillary membrane. Adhesion of the iris to the wound is another cause of an irregular pupil postoperatively. The notch or crease in the iris may be very slight in the first postoperative days and it takes six to 12 months before the final stage is reached. This may be a slight or a marked crease, or the pupillary border is pulled almost to the wound and there is some degree of ectropion of the uvea.

At first glance the most marked cases look like regular iris coloboma. The attachment of the vitreous—the vitreous base—is at the pars plana of the ciliary body, next to the ora serrata. But when vitreous is incarcerated in the wound it is also attached here. In this manner the vitreous forms a hammock around the iris.

Now, quoting Irvine, "We can then imagine that hyaluronidase from the wound edges causes disaggregation of particles producing contraction, condensation, and retraction. . . ." But when the vitreous hammock—the vitreous arch—retracts, shrinks, by shortening the distance between the two areas of fixation, the vitreous arch tends to

become a chord with the result that the iris is pulled toward the periphery, producing the iris crease.

Can this condition happen due to late rupture of the hyaloid membrane? We know that this membrane can rupture anytime, months or years after the operation. How long may the wound posteriorly stay defective so that the vitreous may get attached to it? Dunnington,^{8,9} in experiments on monkeys, confirmed the observations of Purtscher¹⁰ and Maggiore¹¹ that there is microscopic evidence of defective healing posteriorly two weeks after the cataract incision. Maggiore¹¹ and Vail¹² expressed the view that it takes at least two months for the incision to heal completely.

S. Rodman Irvine¹³ has recently seen two cases, in the laboratory, where the posterior surface of the wound remained unhealed for two months after uncomplicated cataract extraction. The patients died of unrelated causes. In his observations on 894 intracapsular extractions in 13 out of 67 eyes the adhesion of the vitreous to the posterior wound was noted more than three months following the operations.

In my series of 33 eyes examined six to 12 weeks after surgery and three or more years later there was not a case of creased iris if it was not present the first 12 weeks. Yet this is too small a series to be definite about the time which may elapse following cataract extraction after which an iris crease will not develop.

This creasing of the iris, if not followed by one of the complications to be described below, does not have too much effect on the vision, except for the fact that the pupil is dislocated and thus the peripheral aspheric portion of the cornea becomes a part of the refractive system.

I want to remark here that in case of manifest loss of vitreous there is always vitreous adhesion to the wound.

3. *Increase of the vitreous opacity* radiating from the vitreous adhesion toward the pupil. The densest opacity is next to the

wound, fading out toward the pupil. Irvine calls this a horsetail type of opacity. It is the result of pulling on the free vitreous by the fixed vitreous thread.

4. *A later stage of this is a dense, opaque condensation of the anterior vitreous face.* Young vitreous will condense more, old watery vitreous less. Of course iridocyclitis may contribute to the density of the vitreous face.

5. *Degeneration or damage of the macula* by the vitreous adhesion is what S. Rodman Irvine calls the vitreous syndrome. It is the end-result of vitreous adhesion to the wound. He says it is an open question whether it is due to the tugging effect of the vitreous or to a mild secondary iritis. He found that when there was no postoperative complication after intracapsular extraction, senile macular degeneration was present in 28 percent. But when the vitreous face was ruptured and vitreous was adherent to the wound, macular degeneration was present in 48 percent. He estimates that there is interference with vision in two percent of all intracapsular extractions due to this syndrome.

In my series of 420 uncomplicated intracapsular extractions there were 302 eyes with peripheral iridectomy and 118 with a full coloboma. Of the 118 eyes with full coloboma there were 12 eyes with adhesions of the vitreous to the wound. One of these suffered retinal detachment. One had only 20/80 vision with central scotoma for blue and green. There were 17 eyes with creased iris, that is with vitreous adhesion posteriorly, of 302 extractions with peripheral iridectomy. Five of the 17 were peripheral notches, that is the iris was pulled up to the wound. This makes it look like a full iris coloboma. All five eyes had diminished vision. In three this was caused by central scotoma. In five of the 12 with small, pointed notches, there was diminution of the vision, though of a minor degree, 20/30 vision. When all the 29 eyes with full or with peripheral iridectomy, showing vitreous adhesion to the wound are considered, we see

that 12 suffered some visual loss. This is close to three percent of all uncomplicated intracapsular extractions. Among these there were four eyes, about one percent, with central scotoma due to vitreous adhesion, which suffered from Irvine's vitreous syndrome.

6. *Among the 29 eyes with vitreous adhesion* to the posterior wound there were two with glaucoma. The average observation time was two years. One would expect a higher incidence of glaucoma, when one third to one fifth of the angle is blocked by the vitreous. However, one wonders whether vitreous adherent in one sector is instrumental in keeping the angle free in the opposite sector by exerting pull against this portion of the vitreous? Kirsch and Steinman observed a patient with acute congestive glaucoma in the sixth postoperative week. There was generalized spread of vitreous over most of the anterior chamber and many foci of vitreous-cornea contact.

7. *Ten of the 420 eyes developed retinal detachment postoperatively.* With the vitreous face intact there were three eyes with retinal detachment out of 302, that is one to 100. With the vitreous face broken or vitreous adherent to the wound there were seven eyes with retinal detachment out of 118, that is one in 17 extractions! This would indicate that a defect of the vitreous face in an aphakic eye is a predisposing factor to retinal detachment.

8. *Corneal dystrophy and its sequela, bulbous keratopathy,* after long-standing contact between vitreous and cornea according to Leahey, occur in approximately 0.5 percent of cases of aphakia. He enumerates the determining factors as: duration of contact, density of contact, location of contact (corneas in which the site of contact extends more than three mm. from the limbus are predisposed), and especially such damaging influences to the endothelium as trauma and Fuchs' dystrophy.

There was not a case of postoperative corneal dystrophy in this series of 420 uncomplicated extractions. But in previous

years I had under observation two persons who developed it in both eyes following extraction. In both eyes of one patient the prolapsed vitreous was in contact with the cornea. The other patient was not examined with a slitlamp. The unanimous opinion seems to put the blame on the abiotrophy or on surgical trauma of the endothelium.

DISCUSSION

What are the practical lessons from these findings? The vitreous face is disintegrating with age, and evidently there is nothing we can do about it. Fortunately manifest vitreous in the anterior chamber if not attached to the wound posteriorly does not cause trouble to the cornea in the great majority of cases, probably only when the endothelium is damaged or degenerated. Yet it is the cause of the pupillary block glaucoma. Chances of retinal detachment are more prevalent when the vitreous face is ruptured than when it is intact. When the vitreous adheres to the wound, it will first cause an iris notch and it may lead to a sequence of events like opacification of the vitreous face and damage to the macula or to glaucoma. The only prevention is to do a full iridectomy when prolapsed vitreous is observed in the anterior chamber following removal of the lens or when the pupil cannot be made round with the iris spatula. If corneal opacity results from the vitreous prolapse, the removal of the adherent vitreous and injection of air is indicated (Leahey, Maume-

nee¹⁴). This condition is more frequent if the endothelium is damaged during operation. Extracapsular extraction is indicated when a marked guttate cornea is diagnosed preoperatively and also when the first eye suffered corneal dystrophy, bullous keratopathy, or retinal detachment after intracapsular extraction. In corneal dystrophy of the first eye McLean's¹⁵ advice, also emphasized by Maumenee, should be followed by making a scleral wound, even at the level of the ciliary body.

The difficulty is that we usually don't know what trouble we may expect from the vitreous when we operate on the first eye.

SUMMARY

Complications arising after uneventful intracapsular extraction of cataract due to changes of the vitreous face are discussed. In the presence of the intact vitreous face herniation of the vitreous may lead to complications but these are rare. However, when the vitreous face is ruptured, vitreous is prolapsed into the anterior chamber, and it may also be adherent to the wound posteriorly. In these eyes complications like glaucoma, retinal detachment, and corneal dystrophy are more common. S. Rodman Irvine's vitreous syndrome is a specific complication of vitreous adherent to the wound posteriorly. Methods of prevention of these complications occurring with prolapsed vitreous in the anterior chamber are discussed.

Old National Bank Building (1).

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THE PRESENCE OF HYALURONIDASE IN THE ANTERIOR CHAMBER*

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METHOD

Bárány¹ has noted decreased resistance to outflow occurring after perfusion of the anterior chamber of animal eyes with testicular hyaluronidase. With Berggren and Vrabec,² he has described a mucopolysaccharide in the angle of the anterior chamber which may account for the decreased resistance.

McCulloch and Beswick³ found no polymerized hyaluronic acid in the aqueous.

It would be interesting to know if hyaluronidase is present in aqueous. If it is, then polymerized acid could not be present, and the ground substance in the angle described by Bárány would be dissolved. Mayer,⁴ using a bacteriologic method, and Bárány,⁵ using a turbidimetric method, could not find any hyaluronidase. Studies using the viscosimetric method have not been recorded; this method was therefore used in examining the aqueous for hyaluronidase.

As hyaluronic acid is much more viscous in the polymerized form than in the depolymerized form, measuring the viscosity is an indirect measure of the amount of polymerized acid present. Vitreous contains polymerized hyaluronic acid. If aqueous contains hyaluronidase, aqueous added to vitreous should reduce the viscosity of the latter and lessen the time required for it to run through the viscosimeter.

Viscosity was measured using the one cc. Oswald viscosimeter. Aqueous and vitreous were separately collected from 12 fresh cattle eyes. Each was pooled in a separate beaker. Ten cc. of normal saline were added to the four cc. of aqueous collected and filtered through a No. 42 Whatman filter paper. Twenty-five cc. of vitreous were added to 100 cc. of normal saline and also filtered through a No. 42 Whatman filter. Commercial hyaluronidase (Wydase) was made up into four solutions of decreasing concentrations. In all, seven solutions were used:

1. Ten cc. of vitreous-saline solution.
2. Ten cc. of vitreous-saline plus aqueous-saline filtrate.
3. Ten cc. of vitreous-saline plus 10 tru of hyaluronidase.
4. Ten cc. of vitreous-saline plus 1.0 tru of hyaluronidase.
5. Ten cc. of vitreous-saline plus 0.1 tru of hyaluronidase.
6. Ten cc. of vitreous-saline plus 0.01 tru of hyaluronidase.
7. Ten cc. of normal saline.

All solutions were kept at 38°C. The time taken for one cc. of each solution to flow through the viscosimeter was measured.

The volume of vitreous in the first six solutions was constant.

* From the Department of Ophthalmology, University of Toronto.

TABLE 1
RESULTS

	Mean Time	Standard Deviation	Solutions Compared	Standard Error between Means	Significance of the Difference
Vitreous and Saline	50.4 sec	1.47	V/S & V/S/A	0.58	1.3
V/S/A	49.6	0.9	V/S & V/S/10 tru	0.61	7.7
V/S/10 tru	46.0	1.09	V/S/A & V/S/10 tru	0.47	7.8
V/S/0.01 tru	46.0	0.95	V/S/A & V/S/0.01 tru	0.44	9.0
Normal Saline	45.7	0.5	V/S/10 tru & V/S/0.01 tru	0.48	0.0
			V/S/10 tru & Normal saline	0.39	0.6

V = vitreous; A = aqueous; S = Saline; tru = turbidity reducing units

The results are shown in Table 1.

INTERPRETATION OF RESULTS

1. There is no significant difference between the viscosity of the vitreous-saline solution and the same solution with aqueous added.

2. There is no significant difference in viscosity between the vitreous-saline solution with 10 tru and that with 0.01 tru of hyaluronidase.

3. There is no significant difference in viscosity between the vitreous-saline-hyaluronidase solutions and normal saline.

4. There is a significant difference in viscosity between both the vitreous-saline-aqueous and vitreous-saline solutions and the vitreous-saline-hyaluronidase solutions.

DISCUSSION

1. By this method, there is no evidence of

free hyaluronidase in the anterior chamber above the concentration of 0.0025 tru per cc. of aqueous.

2. Beswick and McCulloch found no polymerized hyaluronic acid in aqueous. Since this study indicates no free hyaluronidase, there would appear to be, therefore, no depolymerized acid in aqueous.

3. The results of this study and those of Mayer⁴ and Bárány,⁵ that there is no free hyaluronidase in the chamber, indicate that a meshwork of hyaluronic acid in the chamber angle, as described by Bárány,² could be present.

CONCLUSION

There is no hyaluronidase in the aqueous above the concentration of 0.0025 tru per cc. of aqueous, as tested by the viscosimetric method.

Medical Arts Building (5).

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FILTER-PAPER ELECTROPHORESIS OF TEARS*

III. HUMAN TEARS AND THEIR HIGH MOLECULAR WEIGHT COMPONENTS

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Progress has been made in the resolution and identification of the protein and mucopolysaccharide components of normal human tear fluid. This paper describes some of the normal high molecular weight tear components and attempts to identify their glands of origin.

METHODS AND MATERIALS

The electrophoretic analyses were carried out essentially as described earlier¹ with minor changes in the experimental conditions. All runs were made under one of the following sets of conditions: (1) Barbitol-NaCl buffer (pH 7.8, ionic strength 0.16) 3.5 v/cm., or: (2) sodium phosphate-NaCl (0.5 percent) buffer in 10 percent ethylene glycol (pH 7.0, ionic strength 0.07). The potential gradient was either 3.75 or 4.16 v/cm. The traces were scanned on a densitometer connected to a recorder (Varian). Individual tear samples were collected as described earlier.

RESULTS

I. COMPONENTS NORMALLY PRESENT

In 1949, Smollens et al.² reported four protein components in pooled tears analyzed by liquid microelectrophoresis. Later Caselli and Schumacher³ reported five protein components in their filter paper electrophoretic analysis of tears. Recently Brunish⁴ reported six components in his electrophoretic study of pooled tears. Our investigations show

that in the tears of a normal individual five components are usually present. Of these five components, two are easily resolved and are identified as lysozyme and tear albumin; the other three components are not so easily resolved in the usual micro tear samples (3.0 to 5.0 μ l) and are designated as components I, II, and III (fig. 1-B).

Lysozymes. Lysozyme has been known to be present in human tears⁵ since 1922. Studies on egg white lysozyme have shown that it contains fractions of different electrophoretic mobility.⁶ The values for electrophoretic mobility of the lysozyme found in human tears fall into one or the other of two different groupings. These groupings are $(2.2 \pm 0.06) \times 10^{-8}$ cm.²/volt sec. and $(2.5 \pm 0.26) \times 10^{-8}$ cm.²/volt sec. run under the second set of conditions described above and at a voltage drop of 4.16 v/cm. Although statistically significantly different, the reason for such a difference has not been found. In tears of a given individual, the mobility of the lysozyme may change periodically, but both of the two types are not present simultaneously in a single individual. This probably accounts for the presence of two lysozymes of different mobility in pooled samples from several individuals as reported by Brunish.⁴ A "slow-moving" lysozyme was found by us⁷ in several species of animals. It is apparent that lysozyme may possess different electrophoretic mobilities.

Albumins. Erickson⁸ showed the presence of a fast-moving albumin in tears from normal patients. The albumin spot from patients with an inactive lacrimal gland was similar to serum albumin in its electrophoretic mobility. The fast albumin she called "tear albumin." We have confirmed this observation by showing that the mobility

*From the Francis I. Proctor Foundation for Research in Ophthalmology and Department of Ophthalmology, University of California Medical Center. This study was supported in part by a Fight for Sight Award of the National Council to Combat Blindness, Inc., New York City, Grant 166-C, and by the Council for Research in Glaucoma and Allied Diseases.

TABLE 1
CORRELATION OF MOBILITY OF ALBUMIN FRACTIONS WITH NORMAL AND DISEASED CASES

	Number of Cases	Mobility $\times 10^6$ cm ² /volt Sec.*		Type of Albumin
		Center	Trailing Edge	
Normal	20	2.67 ± 0.15	2.34 ± 0.18	Tear
Keratoconjunctivitis sicca	20	2.40 ± 0.08	2.13 ± 0.12	Serum

* Run under the second set of conditions described under "Methods" and at 4.16 v/cm.

of the tear albumin (as measured from the origin to the center of the spot) is significantly faster than the serum albumin. This is shown in Table 1. The mobility of the trailing edge (as measured from the origin to the nearest point of the albumin spot) of both albumins was also determined and found to differ significantly at the one-percent level. This is evidence that the normal tear albumin is not a mixture of serum albumin and a tear albumin. The larger size of the normal tear albumin spot is probably a reflection of a greater polydispersity of tear albumin than of serum albumin.

Although ordinarily normal tears do not contain a mixture of tear and serum albumins, rarely, however, in a single individual, evidence of such a mixture is found (fig. 1-A).

COMPONENTS I, II, and III

In general these three components have mobilities which correspond approximately with the serum globulins (gamma, beta, and α_2 , respectively). These tear components, however, do not correspond in their staining properties with the serum components. Component III and possibly Component II are mucoprotein in composition as shown by their staining with both a protein stain (bromphenol blue) and the mucopolysaccharide procedures of Feeney et al.⁹ In tears with Component I missing, but concentrated to approximate the protein content of the blood serum, the following are noted: (1) The area corresponding to Component III stains with alcian blue while the equivalent area in the serum pattern (α_2) does not

stain; (2) using the periodic acid-Schiff (PAS) technique the tear fractions stain about twice as heavily as the blood serum with dense staining of Component III and moderate staining of Component II and albumin; (3) none of the components accepted the toluidine blue stain.

When the oil red-O fat stain of Durrum¹⁰ is applied to the concentrated tear tracings, an area of neutral fat at the origin and a halo around the albumin spot are stained. The area of Component III shows some staining, while the corresponding area of blood serum does not.

Components I, II, and III are resistant to trypsin and to two mucases, hyaluronidase and chitinase.*

The following comments may be applied to the individual components:

Component I has an isoelectric point more alkaline than pH 7.0 and therefore migrates to the cathode. It is apparently low or absent in tears induced by lacrinating agents or emotion (fig. 1-C). This probably explains why Smollens et al.² obtained only four components. Component I was lost because pooled irritated tears were used, while Caselli and Schumacher³ in demonstrating five components probably used tears collected with minimum irritation.

Component II migrates slightly to the anode (+) and is the only fraction in tears which is always present.

Component III has a slightly greater electrophoretic mobility than Component II.

* Courtesy of Dr. Donald Reynolds, Department of Bacteriology, University of California, Davis, California.

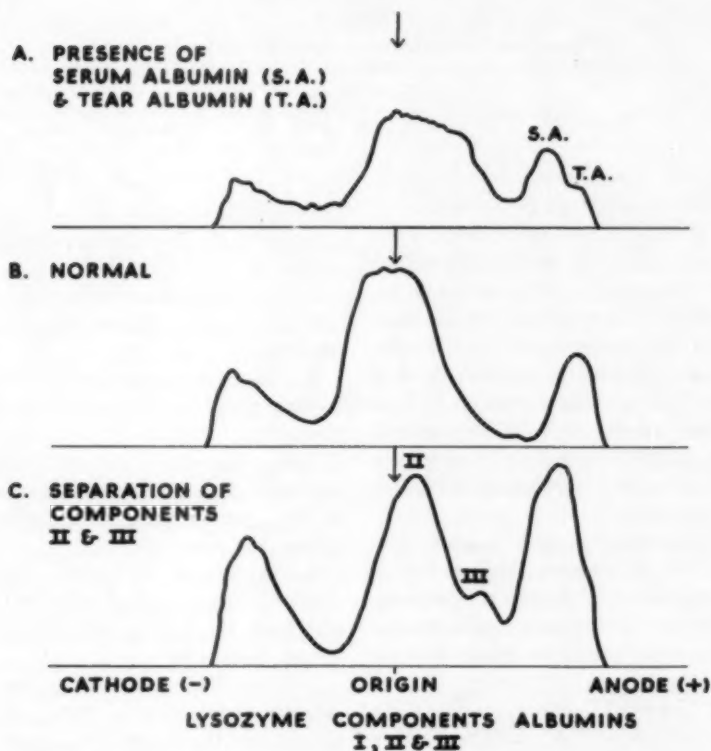


Fig. 1 (McEwen, Kimura, and Feeney). Electrophoretic tracings.

Using micro quantities of tears these two components are difficult to separate. The inability to resolve clearly these components in the usual electrophoretic run while the serum globulins are easily resolved may be due to the mucopolysaccharide nature of the tear components. Goodner¹¹ has shown that increasing the protein concentration and decreasing the salt concentration results in better resolution. Following such a procedure the separation of Components II and III is clearly seen (fig. 1-C).

DISCUSSION

From the data presented, it appears possible to draw some conclusions regarding the glands of origin of tears and the components secreted by those glands.

When the lacrimal gland is removed by

surgery, lysozyme and tear albumin disappear from the tear pattern. This indicates that the lacrimal gland produces lysozyme and tear albumin. On the other hand crying tears from patients with intact lacrimal glands show all of the normal components except Component I. This is evidence that the lacrimal gland secretes Components II and III in addition to lysozyme and tear albumin. This is summarized in Table 2.

Since lysozyme, Components I, II, and III, and tear albumin are all present in normal tear fluid, it is evident that both the lacrimal gland and other glands such as the accessory glands of Krause and Wolfring are contributing to the tear fluid. How much each gland contributes is difficult to assess. The concentration of lysozyme is approximately the same in profuse tears as in normal

TABLE 2
TEAR COMPONENTS AND THEIR PROBABLE GLAND OF ORIGIN

Gland	Lysozyme	Components			Albumins		
		I	II	III	Serum	Tear	Mucus
Lacrimal	+	0	+	+	0	+	0
Accessory	0	+	±	±	0	0	0
Goblet cells	0	±	±	±	+	0	+

tears. Evaporation of tear fluid would tend to concentrate the lysozyme, while the secretion of the accessory glands would tend to dilute the lysozyme. In normal tears it is probable that both effects balance one another, leaving the concentration of lysozyme unaffected. In profuse tearing there is little of either evaporation of tears or contribution of accessory glands, again leaving the concentration of lysozyme unchanged.

When the lacrimal gland is nonfunctioning, as in keratoconjunctivitis sicca, or is removed surgically, the goblet cells probably contribute more to the composition of the tear fluid. As the accessory glands become more and more atrophied, there appears to be less and less fluid in the conjunctival sac but the concentration of all components stays about the same, except for an increase in mucus.

SUMMARY

1. The electrophoretically mobile constituents of normal human tears have been studied.

2. Lysozyme appears to be secreted by the lacrimal gland and its electrophoretic mobility varies.

3. A component is secreted by the lacrimal gland which has an electrophoretic mobility slightly greater than serum albumin. It is called tear albumin.

4. Components I, II, and III appear to differ in mucopolysaccharide and lipid content from the correspondingly mobile blood serum fractions.

5. The evidence relating the fractions secreted to the lacrimal gland, the accessory glands, and the goblet cells is presented.

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TEST FOR RETINAL FUNCTION AND GLAUCOMA*

BY MEASURING MACULAR CAPILLARY BLOOD PRESSURE

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INTRODUCTION

It is well known that fluctuating blood pressure in the brain and eye influences the macular capillary blood pressure in the retina. The control of the capillary pressure by the arteriolar function has been considered by Dieter and others. Duke-Elder states that the capillary pressure may not be influenced by changes in systemic blood pressure. Imachi has described the important relationship between macular capillary pressure and retinal arterial pressure but with little emphasis on systemic blood pressure. In general, it is believed that increased macular capillary pressure is followed by an elevation in retinal arterial pressure.

There are many ophthalmic studies on retinal arterial pressure; however, except for those by Ohashi (1951) and others, not many descriptions of the changes in the macular capillary pressure during pressure tests can be found.

We have previously reported changes in the capillary pressure during various pressure tests in normal and pathologic retinas.^{3, 4, 11} In this paper are presented surveys of retinal function, tests of capillary pressure fluctuation, and drug loading tests in various fundus diseases and glaucoma.

METHOD OF SURVEY

Measuring macular capillary pressure. The macular capillary blood pressure is measured by an endoptic phenomenon, using a kit with a cobalt filter 2.0 cm. in diameter, lighted with a 450-watt electric bulb used in photography, and enclosed in a small box. This portable apparatus can be used conveniently with the patient in any position, as stated by

Bailliart and Uyemura and others.^{1, 10}

The patient is placed before this apparatus. Nupercaine is administered and pressure is applied slowly at the temporal conjunctiva by a modified Bailliart ophthalmodynamometer held by an assistant. As soon as the patient shows a sluggish movement of glimmering granules in his endoptic field, probably caused by the capillary blood current, the reading of the dynamometer is charted by the examiner. Then the value of the capillary pressure is calculated in mm. Hg by the Hasebe's curve, as for the ocular tension. The amount of radiotherapy irradiation, the autonomic nerve-blocking drug, and the posture changes of the patient are correlated with the measurements of capillary pressure in normal and abnormal ocular conditions.

NORMAL CAPILLARY PRESSURE

The normal intraocular blood pressures measured by Ohashi are shown in Table 1 which demonstrates that, in our study, the macular capillary pressure is always lower than the minimal and maximum pressure of the retinal artery, higher than the retinal venous pressure, and about the same or a little higher than that of vortex venous pressure. The average minimum macular capillary pressure is indicated as 30 mm. Hg; the average maximum one is indicated as 50 mm. Hg, almost in agreement with Sobanski's study^{8, 9} (table 2). It can be argued that the reason the macular capillary pressure is a little higher than the cutaneous capillary pressures of 15 to 25 mm. Hg (Lombard) or 20 to 30 mm. Hg (Lieberny) is due to such physiologic peculiarities of the eye as higher tissue pressure.

PATHOLOGIC CAPILLARY PRESSURE

Because observation of fundus diseases is limited, together with the difficulty of seeing

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TABLE 1
NORMAL PRESSURE (MM. HG)

	Maximum Pressure (mm. Hg)	Minimum Pressure (mm. Hg)
Retinal central artery	75-60	40
Macular capillary	50	(MCP) 30
Vortices vein	35	25
Retinal central vein	30	20
Ocular Tension	(18)	

the pathologic endoptic phenomenon in a diseased retina, there are at present few reports describing minimal capillary pressure in pathologic conditions.

Dieter, Baurmann, Lida Adrogué, Samojloff, Sobanski, Fritz, Dobromyslov have only reported changes in capillary pressure. Recently, in glaucomatous eyes, a rise of minimal capillary pressure has sometimes been found with elevation of ocular tension. Furthermore, Sukanuma and others have described elevation of minimal capillary pressure in arteriosclerosis. Miyata has also reported increase of minimal capillary pressure in central chorioretinitis (Masuda).^{1, 2, 3, 7, 10}

Miyazaki has measured minimal capillary pressure in several pathologic conditions, as shown in Table 3. In this study, the ratio (the pathologic value divided by the normal one) always increases in diseased conditions. In papilledema, the ratio is 48.91 percent; in chronic retrobulbar neuritis, 37.39 percent; in the optic atrophy of inflammatory chorioretinitis, 35.81 percent; in diffuse chorioretinitis, 26.44 percent; in central chorioretinitis, 32.91 percent; in retinal pigmentary degeneration, 37.75 percent; in retinal periphlebitis, 27.84 percent; in retinal pig-

TABLE 2
NORMAL CAPILLARY PRESSURE

Report	Author	Retinal Capillary Pressure (mm. Hg)
1925	Dieter	51.5
1927	Baurmann	33-57.5
1927	Lida-Adrogué	40
1927	Serr	30
1935	Uyemura	28.97
1936	Sobanski	33-55
1950	Duke-Elder	50-55
1950	Miyata	30.8
1951	Miyazaki	28-29
1953	Ohashi	30-50

mentary degeneration, 37.75 percent; in retinal periphlebitis, 27.84 percent.

The most significant increase shown is in retinal arteriosclerosis, 91.45 percent; 45 percent in Keith-Wagener type III; 66.4 percent in type II; and 45.26 percent in type I. Therefore, in the early stage of inflammatory fundus disease, an increase in this ratio may be found in almost any case, while in the atrophic stage of an old inflammatory case, a lesser ratio would be shown. This is in agreement with the pressure test to be described later.

TABLE 3
PATHOLOGIC MINIMAL CAPILLARY PRESSURE

Disease	Case	Minimal Capillary Pressure (mm. Hg)	Increase in Ratio (%)
Papilledema	24	41.0 \pm 3.46	48.91
Chronic retrobulbar neuritis	26	38.0 \pm 1.57	37.39
Inflammatory optic atrophy	17	37.4 \pm 2.44	35.81
Diffuse chorioretinitis	13	35.0 \pm 0.39	26.44
Central chorioretinitis	42	36.8 \pm 1.32	32.91
Retinal pigmentary degeneration	30	38.13 \pm 2.96	37.75
Retinal periphlebitis	18	35.34 \pm 1.34	27.84
Angiosclerosis			
Keith-Wagner I	38	40.24 \pm 2.48	45.26
Keith-Wagner II	50	46.1 \pm 2.92	66.40
Keith-Wagner III	31	53.2 \pm 2.48	91.45

In central chorioretinitis (Masuda), the apparent increase of this ratio coincided with Miyata's report. This increase may be because of the existing inflammatory change surrounding the central retinal area. In cases of hyperpiesia there was as much increase in the ratio as in the serious type of Keith-Wagener. This can also be demonstrated by our loading test and in the survey of retinal vessel function.

MINIMAL CAPILLARY PRESSURE CHANGES RADIOTHERMY APPLICATION

Although the fluctuation of retinal vessel caliber, blood pressure, and so forth has recently been described by Ohashi, Iizuka, and Momiki⁶ and Mitsuhashi the change of minimal capillary pressure during these tests has not yet been reported in the Japanese literature.

A microwave current (radiation six meters wavelength; 100-volt apparatus; 4.0 to 5.0 cm. electrode) was applied to both eyes for one to 10 minutes. At the same time, minimal capillary pressure was measured. In normal eyes tested by Miyazaki, the fluctuation of minimal capillary pressure is as shown in Figure 1.

In normal eyes, an evident increase of minimal capillary pressure appeared after 10 minutes of radiothermy irradiation, following an initial fall of minimal capillary pressure during radiation, so that 15 of 20 cases indicated over a 40-percent increase. After irradiation ceased, minimal capillary pressure gradually fell and returned to its initial level after an average of 90 minutes.

In the pathologic eyes, however, minimal capillary pressure changes varied, so that elevation of the minimal capillary pressure in cases of papilledema, chronic retrobulbar neuritis, inflammatory optic atrophy, retinal periphlebitis, Keith-Wagener retinal hyperpiesia II and III, and the late stage of central chorioretinitis was less dramatic than that of normal eyes, with a tendency toward a shorter recovery time after irradiation

ceased. These were marked signs of disease in minimal capillary pressure tests. Furthermore, retinal pigmentary degeneration showed only transient elevation in the minimal capillary pressure test and returned to the primary level within 10 minutes. In contrast, progressive central chorioretinitis (Masuda) and Keith-Wagener type I retinal hypertension showed a marked fall in minimal capillary pressure. In diffuse chorioretinitis, the minimal capillary pressure change showed tardy elevation, due to the tonic state of the vasomotor nerve, and returned to the initial level in about 40 minutes (figs. 1 and 2).

AUTONOMIC NERVE-BLOCKING DRUG

1. ONE CC. IMIDALINE INJECTED SUBCUTANEOUSLY

The dilation of retinal vessels by Imidaline (priscoline) has already been reported. While the change of minimal capillary pressure with Imidaline has been described by Dieter, Endo, and Nakamura in normal eyes only, there is a paucity of reports on the effect of the Imidaline on the diseased fundus. Therefore, we investigated such drugs as Imidaline, Adopon, and hexamethonium, injected subcutaneously, charting the minimal capillary pressure and brachial blood pressure during the 120 minutes after injection.

In normal eyes, changes of the minimal capillary pressure by Imidaline were noted by Miyazaki and Yamada who concluded that there was a conspicuous increase of minimal capillary pressure after 10 to 20 minutes, returning to the initial level after 50 minutes. This was in accordance with Ohashi and Iizuka's data on retinal vessel dilation after Imidaline.⁶

In pathologic eyes, the fall of minimal capillary pressure with Imidaline was ascertained in papilledema, progressive central chorioretinitis, Keith-Wagener types II and III retinal hypertension. There was a slight fall in pigmentary degenerations of the retina. However, the elevation of minimal capil-

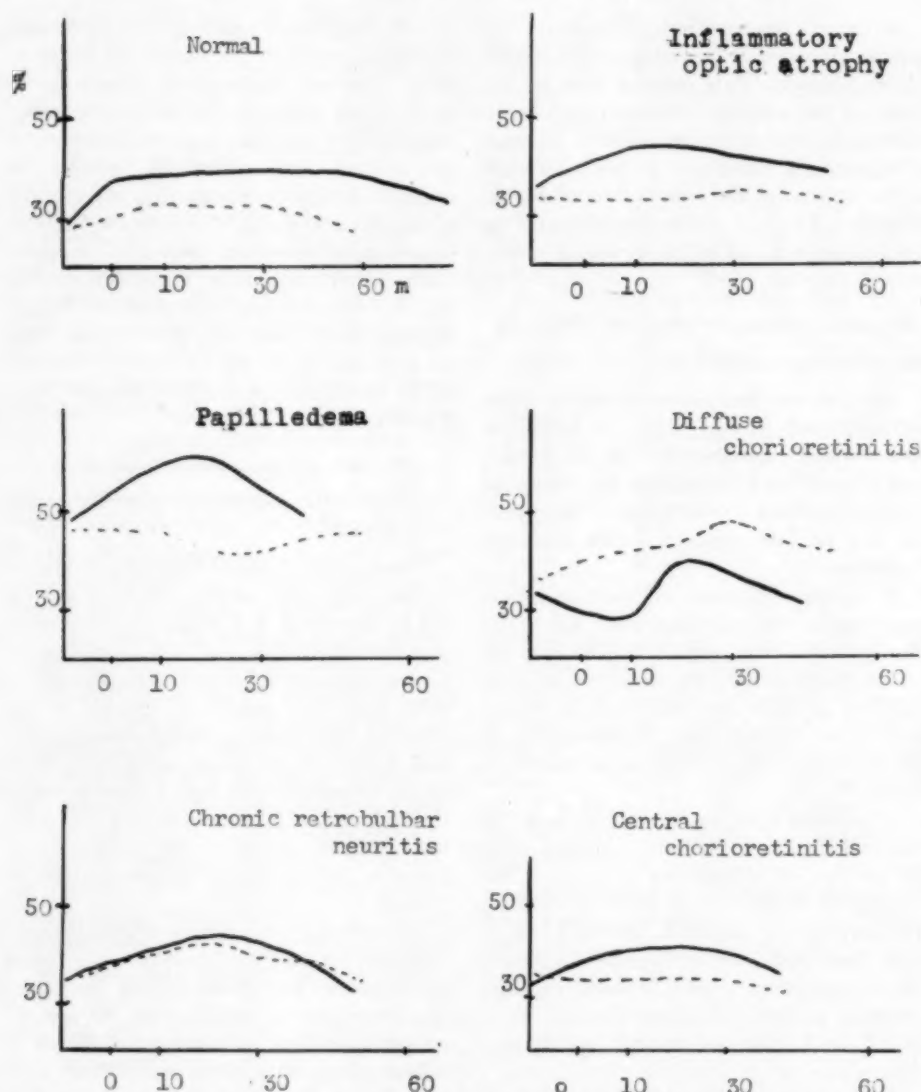


Fig. 1 (Ohashi, et al.). Findings with radiotherapy and Imidaline. (Radiotherapy—; Imidaline - - -.)

lary pressure was observed in this test in diffuse chorioretinitis, chronic retrobulbar neuritis, and retinal periphlebitis, all of which showed increases above normal. We found a definite increase in Keith-Wagener type I hypertension. A less than normal increase was found in inflammatory optic atrophy and the

recovery stage of central chorioretinitis (fig. 1).

2. ONE CC. ADOPON INJECTED SUBCUTANEOUSLY

Adopon, which has an atropinelike parasympatholytic action, was used to chart the

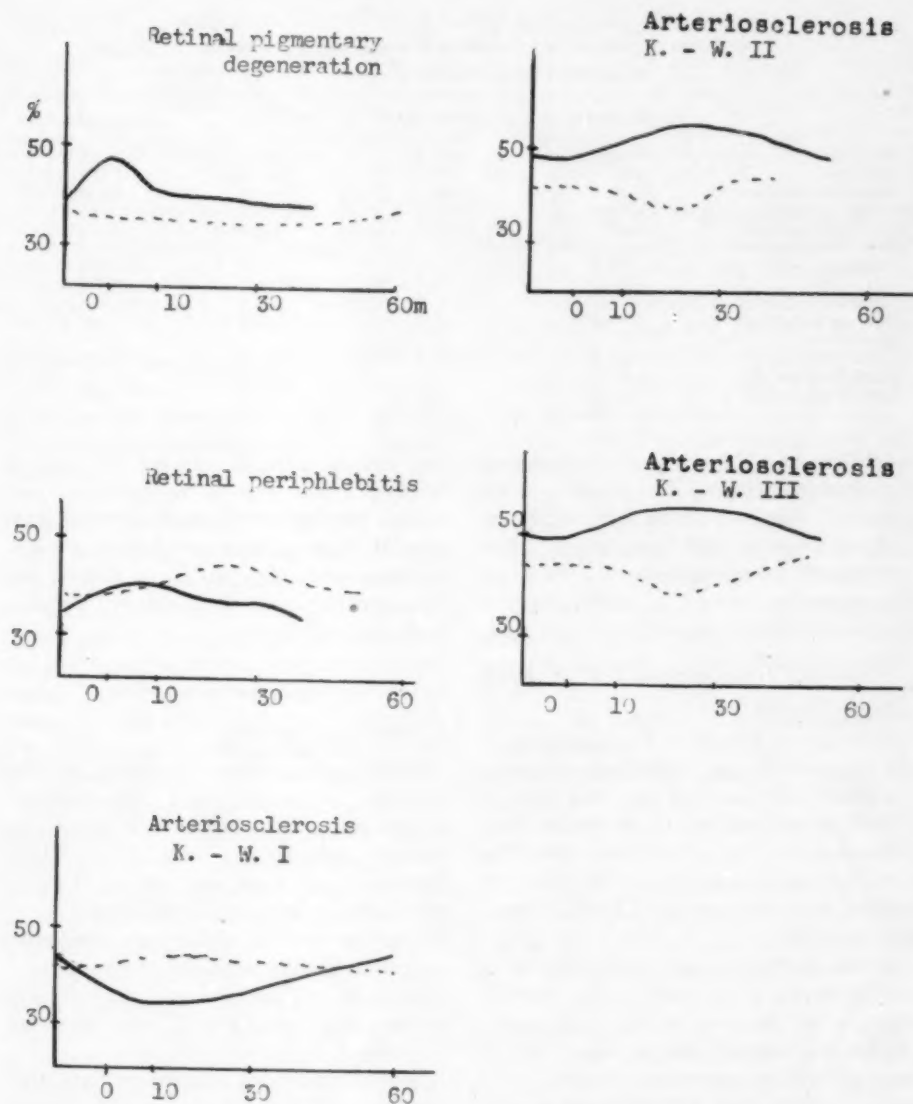


Fig. 2 (Ohashi, et al.). Findings in various diseases.

minimal capillary pressure. In this test minimal capillary pressure showed a definite fall in normal eyes after 20 minutes and near recovery after 50 minutes.

In pathologic eyes, there was a distinct fall of minimal capillary pressure except for

a slight rise in retinal pigmentary degeneration and diffuse chorioretinitis. In papilledema, retinal periphlebitis, central chorioretinitis, retinal hypertension, and chronic retrobulbar neuritis, there was a distinct fall of minimal capillary pressure rather than a

TABLE 4
AVERAGE CHANGE RATIO PERCENT IN MINIMAL CAPILLARY PRESSURE
(after administration of drugs)

	Radiothermy	Imidaline	Adopon	Hexamethonium
Normal eye	+40.3	+12.7	-6.7	+15.1
Papilledema	+11	-9.7	-15.8	-9.8
Retrolbulbar neuritis	+20.9	+10.3	-9.9	-6.3
Infl. optic atrophy	+14.6	+8.1	-2.9	-16.6
Diffuse chorioretinitis	+13	+31.5	+9.3	+14.9
Central chorioretinitis				
Progressive stage	+6.8	-9.3		
Late stage	+15.2	+5.0	-11.1	-7.2
Pigmentary degeneration	+4	-6.2	+3.9	-3.3
Retinal periphlebitis	+8.6	+11.7	-7.7	+9.3
Angiosclerosis				
Keith-Wagener I	-20.3	-11.3	+7.1	+7.8
Keith-Wagener II	+10.1	-2.1	-13.4	-23.3
Keith-Wagener III	+7.07	-8.7	-5.4	-8.4

normal reaction. Especially in angiosclerosis were there conspicuous parallels between the degree of sclerosis and the fall of minimal capillary pressure, with the greatest fall in progressive retinal angiosclerosis. In a case of postneuritic atrophy, a smaller decrease than in normal eyes was found.

3. ONE CC. HEXAMETHONIUM INJECTED SUBCUTANEOUSLY

There are no reports on the minimal capillary pressure change when hexamethonium is applied as the autonomic blocking agent. A rise of minimal capillary pressure with hexamethonium was found in normal eyes. The most distinct increase was visible after 30 minutes, with near recovery 75 to 90 minutes after injection.

In the pathologic eyes, the decrease of minimal capillary pressure in this test was noted in all diseases of the optic nerve. Papilledema showed the strongest fall of minimal capillary pressure; chronic retrolbulbar neuritis and inflammatory atrophy showed moderate falls. However, retinal pigmentary degeneration and a slight case of angiosclerosis showed only an insignificant reaction to this test. In chorioretinitis or retinal inflammatory edema, a transient increase of minimal capillary pressure was estimated. In retinal periphlebitis, there was a characteristic increase, with the strongest

rise coming after 15 minutes. In cases of Keith-Wagener type I hypertension only normal findings were recorded. The average ratio of change in minimal capillary pressure in these tests with drugs in normal and abnormal eyes after 30 minutes of pressure is shown in Table 4.

HEAD-LOWERING TEST

1. POSTURAL CHANGE

Regarding the change in minimal capillary pressure in normal eyes with postural change, we could find only a few reports, for instance those by Uyemura, Fritz, Ishida, Nakajima and Kato, and others. Miyazaki systematically investigated this problem and charted the minimal capillary pressure before and after 15 minutes in the horizontal position in normal and diseased persons. The average ratio changes in this test are shown in Table 5.

In brief, increased minimal capillary pressure after 15 minutes of change in posture was most evident in cases of choked disc. The increase was moderate in central chorioretinitis and congestive diseases of the posterior half of the globe. There was a slight increase in minimal capillary pressure in Keith-Wagener type II hypertension, retinal pigmentary degeneration, and intraocular angiosclerosis. Keith-Wagener type III an-

TABLE 5
POSTURAL CHANGE IN MINIMAL
CAPILLARY PRESSURE

Disease	Average Change Ratio (%)
Normal eye	27.65
Papilledema	47.01
Central chorioretinitis	41.62
Inflammatory optic atrophy	14.92
Pigmentary degeneration	37.58
Angiosclerosis	
Keith-Wagener II	38.74
Keith-Wagener III	17.07

giosclerosis, however, showed a slighter increase than normal eyes. On the contrary, there was less increase than normal in cases of postpapillitic atrophy, even when accompanied by an inflammatory process.

2. HEAD-LOWERING IN NORMAL EYES

The head-lowering test was carried out in 258 normal eyes by Yamada, measuring both the minimal capillary pressure and the ocular tension. In this test, the primary value P_0 of minimal capillary pressure and ocular tension in the sitting position, and P_1 of minimal capillary pressure and ocular tension were computed. This means that both the value after 10 minutes of the head-lowering test, at 15 degrees from the horizontal lying position, and P_2 of minimal capillary pressure and ocular tension in the original sitting position, 10 minutes after completing the head-lowering test, were measured. Then the E of difference between $P_1 - P_0$ was noted.

Some double doses of such drugs as Imidaline, Contomine, Teabrom, hexamethonium, Neosynesine, Prehormone, cortisone, Kallikrein, acetylcholine, Egaline, Finaline, pilocarpine, homatropine, and their combinations were studied with this simple head-lowering test. The change in anterior ciliary venous pressure (CV), central retinal venous pressure (RV), and vortex venous pressure (VV) was then measured before and after the head-lowering test, using the method reported recently.⁵

In this test, the E percent elevation ratio and F percent as falling ratio were calculated

by the following formulas:

$$E\% = \frac{P_1 - P_0}{P_0} \cdot 100$$

$$F\% = \frac{P_1 - P_2}{P_1 - P_0} \cdot 100$$

In normal eyes, in this head-lowering test, P_0 of the minimal capillary pressure was 27.14 ± 1.371 mm. Hg (average); P_1 showed 38.44 ± 1.802 mm Hg; P_2 showed 27.52 ± 1.932 mm. Hg. Further, P_0 of the ocular tension was 17.68 ± 1.936 mm. Hg; P_1 was 20.15 ± 2.761 mm. Hg; P_2 was 17.74 ± 1.937 mm. Hg.

In the normal double dosage test with Imidaline injections, the minimal capillary pressure was observed as $P_1 = 42.43 \pm 2.171$ mm. Hg, $P_2 = 31.66 \pm 2.357$ mm. Hg; ocular tension was as $P_1 = 21.83 \pm 2.46$ mm. Hg, $P_2 = 18.38 \pm 1.701$ mm. Hg.

Also in the normal double dosage test with Contomine (chlorpromazine) injection, the minimal capillary pressure was as $P_1 = 31.25 \pm 1.29$ mm. Hg, $P_2 = 24.5 \pm 2.0$ mm. Hg (table 6). The other data with drugs are shown in Table 7 with the changes of E percent and F percent.

3. HEAD-LOWERING TEST IN GLAUCOMA WITHOUT DRUGS

Sixty-seven glaucomatous eyes were divided into three groups: Group I, ocular tension up to 30 mm. Hg; group II, within 31 to 40 mm. Hg; group III, over 41 mm. Hg.

The grade of visual acuity (V), visual field (F), and glaucomatous cupping of the disc (C) were also divided into three groups in order to express the clinical glaucomatous symptoms: (1) V-I group vision less than 0.8; V-II, 0.7 to 0.2; V-III, less than 0.1. (2) F-I, less than 10 degrees contraction; F-II, less than 20 degrees; F-III, 30 degrees or over. (3) C-I cupping slight, C-II moderate, C-III severe.

The changes in E percent, F percent, E of the minimal capillary pressure, and the

TABLE 6
HEAD-LOWERING IN NORMAL EYE

Cases		E %		F %		E	
		MCP	OT	MCP	OT	MCP	OT
One dose	50	41.6	14.01	96.6	97.6	11.3	2.5
Double dose							
Imidaline	30	50.7	22.4	69.9	86.3	15.3	4.0
Contomine	8	17.4	-10.12	145.8	-43.0	4.6	-1.6

TABLE 7
MINIMAL CAPILLARY PRESSURE IN NORMAL EYES AFTER DOUBLE DOSES OF DRUGS

Drug	E %	F %	Cases
Imidaline	50.7	70.0	30
Contomine	17.4	145.8	8
Teabrom	25.6	88.9	10
Hexamethonium	36.9	62.7	10
Neosynesine	52.6	72.0	10
Prehormone	48.9	64.7	10
Cortisone	43.4	63.3	8
Kallikrein	10.2	90.0	10
Acetylcholine	40.5	73.5	10
Egaline	37.1	98.4	6
Finaline	36.6	73.3	10
Pilocarpine	27.0	118.2	10
Homatropine	37.6	82.1	8
Pilocarpine+Imidaline	41.5	75.7	10
Homatropine+Imidaline	44.4	69.2	10
Adrenaline+Finaline	25.1	94.1	10
Pilocarpine+Contomine	26.6	102.4	6
Adrenaline+Contomine	14.8	212.5	6

ocular tension in the three groups of glaucoma cases with the simple head-lowering test without drugs are shown in Table 8. From this test we conclude that the increase of minimal capillary pressure and ocular tension indicates retino-uveal postural stasis. Therefore, the E percent might show a response to intraocular capillary balance during a state of artificial stasis. The F percent might show release from the stasis.

With regard to glaucomatous changes of minimal capillary pressure and ocular tension certain findings have been demonstrated

by this test. Considering the ocular tension, the value of E and E percent showed an increase above normal in group I glaucoma. F percent showed an apparent decrease in group II glaucoma, but the value of E was always similar in all groups of glaucoma. The value of E percent in group III glaucoma did not show more than normal increase because the intraocular stasis had already reached the upper limits.

On the other hand, there was always an evident rise of minimal capillary pressure as in P_0 , 38.28 mm. Hg in group I, 48.2 mm. Hg in group II, 63.4 in group III. However, the average elevation of E was 10.8 m.m. Hg in group I, 8.2 mm. Hg in group II, 10.8 mm. Hg in group III, similar in value to the normal E.

These findings with this test in glaucoma can also be affirmed by the following data: The correlation rate between E and P_0 was -0.0002 , nonsignificant for ocular tension. The same rate between E and E percent was 0.24 ± 0.18 , significant for ocular tension.

4. HEAD-LOWERING TEST IN GLAUCOMA AFTER DRUGS

A. Double pressure test with Imidaline.

As to the minimal capillary pressure the average E was 12.4 mm. Hg in group I, 14.8

TABLE 8
TESTS WITHOUT DRUGS IN GLAUCOMA

	E %		F %		E		Age (yr.)
	MCP	OT	MCP	OT	MCP	OT	
Group I	20.0	20.0	100.0	100.0	8.0	5.0	22
Group II	31.1	22.9	78.6	62.5	14.0	8.0	63
Group III	16.7	8.3	70.0	50.0	10.0	4.0	62

TABLE 9
DOUBLE TESTS WITH IMIDALINE IN GLAUCOMA

	E %		F %		E		Age (yr.)
	MCP	OT	MCP	OT	MCP	OT	
Group I	22.5	28.0	33.3	42.9	9.0	7.0	22
Group II	25.9	37.5	50.0	46.7	14.0	15.0	63
Group III	32.8	35.4	20.0	47.1	20.0	17.0	62

mm. Hg in group II, 15.5 mm. Hg in group III glaucoma simplex. Therefore, the increase of minimal capillary pressure after Imidaline injection is proportionately dependent upon the uveal stasis due to head-lowering and uveal vessel dilation caused by the drug. An evident decrease of F percent was found after this test and the falling effect produced by Imidaline was more prolonged than in normal eyes (table 9).

As to the ocular tension, E averaged 8.2 mm. Hg in group I, showing a greater increase than in the same test without the drug. Also E percent increased and F percent decreased. In group II there was an increase of E averaging 11.0 mm. Hg, an increase of E percent, a decrease of F percent. In group III there was an average increase of E of 11.8 mm. Hg with E percent and F percent the same as in the previous group. Therefore, the value of E is proportionately dependent upon P_0 in the ocular tension.

B. Double pressure test with Contomine.

As to the minimal capillary pressure the average E was 3.0 mm. Hg in group I, 3.5 mm. Hg in group II, and 2.0 mm. Hg in group III. While the average E percent was 7.88 in group I, 6.96 percent in group II, 3.6 percent in group III, but F percent averaged 140.16 percent in group I, 405 percent in group II, 650 percent in group III. There-

fore, the tendency of E under chlorpromazine was to show about the same inactivity as in normal eyes. Moreover, with this test, the minimal capillary pressure showed an evident rise of F percent in glaucoma. As to the ocular tension, E averaged -2.8 mm. Hg in group I, -5.6 mm. Hg in group II, -7.6 mm. Hg in group III. E percent and F percent showed negative values in all groups of glaucoma, due to the nerve-blocking effect of this drug (table 10).

C. Double pressure test after iridencleisis. The head-lowering test 21 to 35 days after iridencleisis in simple glaucoma was given to two patients. In these eyes which had undergone operation, not only the complete recovery of change in ocular tension and minimal capillary pressure in P_0 could be confirmed but also the almost normal value of E, E percent, and F percent with Imidaline and Contomine.

COMMENT

It would seem that the increase of the minimal capillary pressure follows the state of the local circulation in the inflamed fundus, as a general rule, and especially the change of intraocular vessel tonus in the angiosclerosis. Because of this it was possible to collect much information regarding characteristic fluctuations in the diseased

TABLE 10
DOUBLE TESTS WITH CONTOMINE IN GLAUCOMA

	E %		F %		E		Age (yr.)
	MCP	OT	MCP	OT	MCP	OT	
Group I	2.04	-13.9	150.0	-75.0	1.0	-4.0	22
Group II	3.9	-10.0	550.0	-25.0	2.0	-4.0	63
Group III	-1.6		-400.0		-1.0	0.0	62

fundus and in glaucoma by charting the minimal capillary pressure after radiotherapy irradiation, injection of nerve-blocking drugs, and head-lowering tests after administration of drugs.

In glaucoma our findings regarding the increase of the minimal capillary pressure seem to be in agreement with the reports of Fritz and Dobree, and others. In this study the minimal capillary pressure was analyzed and investigated by means of administration of several drugs.

Regulation of ocular tension may be achieved by injections of Imidaline or chlorpromazine. Imidaline causes increase in the minimal capillary pressure and ocular tension by peripheral action, chlorpromazine causes the decrease of minimal capillary pressure and ocular tension by central sup-

pression of vascular permeability.^{4,5,11}

From this may be assumed that glaucomatous hypertension is due to an imbalance between the peripheral vascular regulation of the midbrain and uvea and corticocentral conduction involving vessel permeability.

CONCLUSION

Several tests of the macular capillary blood pressure are described. In normal and pathologic eyes, the characteristic alterations of capillary pressure with radiotherapy irradiation, injection of autonomic drugs, or the head-lowering test with drugs were presented. The regulating mechanism of the ocular tension in glaucoma is discussed in light of these findings.

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A CONTRIBUTION TO THE DIAGNOSIS OF ARTERIOSCLEROSIS AND HYPERTENSION

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Between the years 1928 and 1939, I published a series of papers¹⁻⁵ dealing with changes of the retinal vessels in arteriosclerosis and hypertension, with emphasis on those changes that were of particular diagnostic significance.

Since the publication of these papers, there has been a considerable increase of interest in these changes—not only on the part of the ophthalmologist but also on the part of the cardiologist, the internist, and the neurologist. Quite frequently, the ophthalmologist is asked his opinion on the retinal vessels that might offer valuable diagnostic, therapeutic, and, particularly, prognostic clues in these diseases.

It is not always possible to answer such questions in as decisive a manner as might be desirable. As a rule there is a series of changes that permit a positive answer in pronounced and advanced cases. Frequently, however, particularly in doubtful cases as well as in the initial stages, the ophthalmologic findings are ambiguous just when they could be of greatest interest. Not only are the changes not sufficiently distinct, but numerous physiologic variations of the eyeground, like vascular reflexes, sheathing of vessels, changes in their course, as well as senile and acquired changes of a different nature, may also be misleading in the diagnosis. These are the findings that frequently cannot be differentiated with any certainty from changes due to hypertension and arteriosclerosis.

Identical changes that would be regarded as congenital variations if seen in young people would be considered as pathologic by a trained observer if they occurred in older persons with known or suspected positive systemic findings. Perhaps uncon-

sciously one bases a diagnosis of the diseases under discussion largely upon circumstances that, though of great importance, are incidental to the ophthalmoscopic findings. Such circumstances are the age of the patient, his general condition, his history, and so forth. Often the evaluation of the vascular changes of the retina is influenced by such extraneous factors rather than a completely independent and objective conclusion—a fact that, naturally, detracts from its value.

In order to form an opinion to determine whether and to what extent the diagnosis based on the eyeground findings would be biased by the allusions cited above, I set up a series of investigations which would preclude such knowledge.

My assistant selected a series of patients. One third in this series were definitely hypertensive, one third were arteriosclerotic of varying degrees and diverse ages, and one third were healthy young people. When I examined these patients, I was unaware of their age or general condition. The patients were brought to the dark room in my absence. Their bodies were draped with a cloth and their heads covered with a hood that included even the eyebrows, leaving only the eyes exposed. The patients had been instructed not to talk so I could not get any clues pertaining to their age or illness. Eyes with senile changes (for instance incipient cataracts) had been excluded. For reasons to be discussed later, I did not examine the fovea. My findings were recorded in detail.

I continued these investigations for about one year. I had to discontinue them because of the war and could not resume them later. I examined a total of 69 cases in this manner. In spite of this small number I believe I have accomplished my goal. The results seem to

be interesting enough to report them here.

As expected, I obtained the best results in the hypertensive group. The diagnosis was correct in about 70 percent of the cases. It should be stated that not all patients in this group had a permanent severe hypertension. Less satisfactory were the results in the second group of arteriosclerotic patients without or with only slight increase of the blood pressure. My diagnosis was correct in barely one half of the cases. It should be taken into consideration that not all of these were severe cases. It also is well known that not infrequently there are severe sclerotic changes of certain vascular areas, for example, the aorta, the coronary and cerebral vessels, whereas the retinal vessels show either only slight involvement or none at all. I did not anticipate beginning with as close a correlation between the systemic and ophthalmoscopic findings in this group as in the first group.

These factors may partly explain the unsatisfactory results in the second group. There was no such excuse for the deplorable failure in the third group. I diagnosed arteriosclerosis in more than half of the 26 patients that made up this group when their age, general condition, and repeated physical examinations permitted the ruling out of arteriosclerosis with almost absolute certainty. Granted that one or the other patient may have shown changes characteristic of (juvenile) arteriosclerosis that involved the retinal vessels without causing other symptoms, it is unlikely that such rare cases should have made up such a large percentage just in my series. Without doubt I was mistaken in my diagnoses by interpreting certain physiologic anomalies as pathologic changes.

My investigations clearly indicated to me that our former diagnostic criteria, criteria that are accepted to this day, were unsatisfactory except for hypertension. They required the ancillary consideration of the factors already cited. It makes it necessary to re-evaluate those signs that, according to my records, caused most frequently a wrong interpretation.

I. ARTERIAL REFLEXES

My notes on the last group indicate that increased "hard" reflexes of the retinal arteries were the most common reason for some of my wrong diagnoses.

It is well known that the intensity of the arterial reflexes varies a great deal even in normal cases. Frequently one finds quite pronounced arterial reflexes—either involving the entire eyeground or circumscribed areas—that, in the continued absence of other changes, must be regarded as physiologic or perhaps congenital variations. Yet, there is general agreement that morbid changes can also cause an increase in the reflexes of the arterial walls. That makes it quite difficult to decide in a given case when a reflex ceases to be normal and when it should rightfully be classified as a "hard" or pathologic reflex, because, in most instances, only gradual, imperceptible changes have to be evaluated.

At the time when I was a resident in Prague, Professor Deyl, an old and very competent teacher, suggested a somewhat drastic solution of this problem, controversial even at that time. He called every case with prominent reflexes, be it in old or in young people, retinal arteriosclerosis, without consideration for other incidental findings. The grotesque result was that many children and perfectly healthy adolescents left the clinic to which they had come quite unsuspectingly for a refraction or treatment of a blepharitis with the odious diagnosis "retinal arteriosclerosis." I need not dwell on the severe psychologic and sociologic shock that such a course of action would create nowadays. Yet some of these principles have not changed up to this day. Even in our time, every prominent reflex is usually regarded as pathologic—perhaps not in children but in patients of the "arteriosclerotic age." Even though the most drastic mistakes are avoided, certainly enough wrong diagnoses are made.

At times, the arterial reflex is so brilliant that, at first glance, it leaves no doubt that it is the result of a morbid change. These are the "silver wire" arteries first

described by Gunn in 1892 ("copper wire" arteries if the reflex is reddish). Fully developed silver wire arteries are quite rare. If not fully developed, it is possible, especially for a less experienced examiner who perhaps has never seen true silver wire arteries, to confuse them with strong physiologic reflexes.

Some authors talk about "silver wire arteries" when the wall changes, especially the opaqueness and thickening, are so intense that the blood column is reduced to a very fine thread which is broken in places. Though these vessels are changed into white chords or threads, they do not, as a rule, impede circulation.

Such vessels do not belong to the silver wire arteries of Gunn's classification. The term is incorrect because the same changes, perhaps even predominantly, are found in veins. They may be the result of inflammatory processes like retinal phlebitis, luetic or other vascular diseases, or some retino-choroiditic affair. In addition, they are occasionally found in pigment degeneration of the retina, or as the result of circulatory disturbances, for example, embolism or venous thromboses. They occur only very rarely as primary manifestations of a sclerotic or hypertensive vascular disturbance and then, as a rule, only in the finest capillaries of the foveal region, that is, the pre-arterioles or arterioles, which are rendered visible only by the whitish increase in the thickness of the vessel walls. I shall discuss these factors once more in connection with the so-called accompanying stripes.

In my attempts to learn to differentiate the pathologic from the increased physiologic reflexes, I have been guided by:

The *normal* arterial reflex stripes originate on the anterior surfaces of the blood column. They should disappear after the circulation has been temporarily interrupted by forceful digital pressure on the globe. On the other hand, *pathologic* reflexes originate on the vessel wall itself and should remain visible after cessation of the circulation under digital pressure.

Unfortunately, the actual application of these principles to classify arterial reflexes was disappointing. This procedure allowed only the observation of the disc and its immediate surroundings. It could not be employed satisfactorily in unco-operative, nervous, or apprehensive patients.

Though the digital compression has to be quite forceful, it is completely innocuous. In considerably more than a thousand cases examined in the course of the years I have never seen any ill results even in patients with impending or actual thrombosis, retinitis, retinal hemorrhages, and other similar conditions.

The phenomena that occur in ophthalmoscopy under digital pressure are well known. I mention only those that have a bearing on the subject. If digital pressure is continued after the appearance of pulsation, the disc becomes pale, its vessels are more or less invisible, and the vascular reflexes disappear. The normal connective and glial tissue that emerges together with the vessels from the central canal appears as a brilliant white mass. In some exceptional cases—for instance, with the anomalous vessel distribution typical for fundus inversus—there is a striking picture, especially after ordinary ophthalmoscopy when the same tissue usually is inconspicuous and frequently appears only as a fine, gray veil. Under further increase of the digital pressure, a small area of one to one and one-half disc diameters surrounding the disc becomes paler, and the arterial pulsation extends to this area, or the arteries collapse. Frequently, and more distinctly than in ordinary ophthalmoscopy, the connective tissue seems to extend from the disc along the vessels forming the so-called accompanying stripes. Their pathologic significance will be discussed below.

Although ophthalmoscopy under digital pressure does not enable one to differentiate pathologic vascular reflexes from the physiologic varieties in the periphery of the fundus, it makes such observations on the disc itself possible. Not infrequently short sections of

the central vessels show striking reflexes, whereas the remainder of the eyeground reveals vascular reflexes within normal limits. Such findings suggest circumscribed sclerotic changes. If, in some cases, the reflex disappears completely under digital pressure, rendering the vessel wall invisible in the area involved, one is justified in ruling out severe opacification of the wall but not plain thickening of the wall: the reflex, like the normal reflex, originates from the anterior surface of the blood column. In spite of its "hardness" it is not pathologic.

In other cases with a similar ophthalmoscopic appearance, the caliber as well as the reflex in a limited area persist even though the blood column distally and proximally is almost interrupted and the vessel definitely collapsed. Here the reflex must have originated from the altered vessel wall, that is, it is a pathologic reflex. Another factor serves to distinguish pathologic from physiologic arterial reflexes, that is, the crossing phenomena that are the result of the same pathologic changes and are hardly ever missing. This important diagnostic factor will be discussed later.

To sum up, my investigations demonstrated that "hard" reflexes are unreliable and often misleading in the diagnosis of hypertensive and arteriosclerotic retinopathy. One is not justified in assuming pathologic changes of the vessel wall whenever there is a somewhat increased reflex in the absence of other significant signs.

Only Gunn's silver (and copper) wire arteries must be regarded in every instance as the manifestation of a severe vascular disease, provided this term is reserved only for the rare true silver wire arteries as described by Gunn, and not, as is done so often today, for the somewhat more prominent reflexes that may well be physiologic.

In suitable cases one can determine by means of ophthalmoscopy under digital pressure whether an increased reflex originates from the vessel wall and, thus, is pathologic.

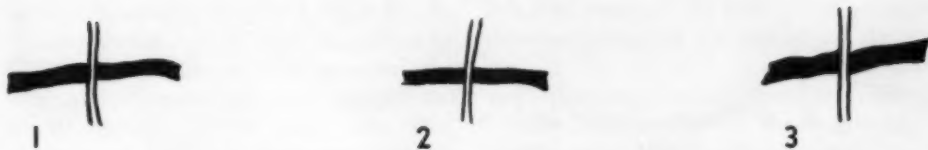
II. CROSSING PHENOMENA

Some of the most important areas for the evaluation of the retinal vessels are the arteriovenous crossing points. However, some of these phenomena differ in type and origin and, thus, vary in their diagnostic significance. There is a common topographic-anatomic basis that influences the ophthalmoscopic picture of the crossing points.

As a rule, the artery crosses over the vein. A "reversed crossing" occurs much more rarely and will be discussed later. Of further significance is the order of magnitude of the crossing vessels. Either the crossing vessels are of the same order, or a large artery crosses a small vein, or a small artery crosses a large vein. The picture is further influenced by the angle formed by the vessels. At times the vessels are not in direct contact but separated by a transparent tissue layer. Also, one occasionally sees a pronounced tortuosity of the veins. Under pathologic conditions, the ophthalmoscopic picture of the crossing is also influenced by the underlying systemic disorder as well as by the extent of the local vascular changes.

In one of the possible patterns, the vein is covered by the artery at the crossing and rendered invisible. There is no compression of the vein and no change in its course; the extent of the covered section does not exceed the width of the artery. Gunn described this phenomenon in 1892 as the manifestation of decreased transparency of the vessel wall caused by the pathologic process. Originally I was in agreement with Gunn.¹ After having been misled by this sign on many occasions in the course of my investigations, I attempted to re-evaluate it in more detail, and came to the conclusion that the explanation just offered was not correct.

In many cases it is without doubt correct that the artery covers the vein and causes it to be invisible or appear interrupted (figs. 1, 2, and 3). There are two aspects that should be examined. In the first place, the extent to which the vein will be obscured



Figs. 1, 2, and 3 (Salus). (fig. 1) Normal crossing. (fig. 2) Vein obscured at crossing. (fig. 3) Change of course of vein at place of nicking. Pathologic.

depends directly on the caliber of the crossing arterial blood column, that is on the a:v ratio. In the second place, the arterial reflex has to be taken into consideration: even a slight increase may obscure the underlying vein completely. It is immaterial whether the increase of the reflex is physiologic or whether it is pathologic and due to a change in the vessel wall. Consequently, the presence of this phenomenon per se is no indication for a pathologic change in the vessel wall. Only nicking of the vein or a change of its course (fig. 3) in addition to its apparent interruption by the crossing artery is definite proof of an involvement of the vessel wall. In such an event, it is not the obscuring of the vein but the change in the course or the indentation of the vein (frequently a sign present even in early forms of arteriosclerosis and to be discussed later) that permits one to make a positive diagnosis.

If the change in the course is missing, a crossing phenomenon alone (fig. 2) excludes almost certainly pathologic changes of the vessel wall. Such a statement is a direct contradiction to Gunn's theory to which I had originally subscribed. The fact that the phenomenon occurs in young and healthy individuals as well as in patients with arteriosclerosis is in complete agreement with my newer concept. I was able to observe in a few favorable cases that the reflex disappeared under digital compression and that the vessel wall became invisible, proof that the reflex was normal and originated at the anterior surface of the blood column.

With the conclusion that this pattern of the crossing phenomenon is of no conse-

quence for the ophthalmoscopic diagnosis of arteriosclerosis and hypertension, I shall now proceed to discuss a pattern for which the contrary holds true. Again it was Gunn who made the first observation (1892) that the vein underneath a crossing artery occasionally did not show a distinct blood column. He was of the opinion that the vein was compressed because of the increased pressure and the rigidity of the retinal artery. During a discussion in the London Ophthalmologic Society in 1904, his concept was refuted with the objection that, if it was true, there should be a venous congestion distal to the compression which, as a rule, does not happen.

More recently, Raehlmann mentioned the same picture with the explanation that a circumscribed sclerosis of the venous wall results from pressure caused by the artery. His publication, likewise, received little notice.

Subsequently, the crossing phenomena fell into oblivion—obviously a result of the disapproval voiced during the London discussion. These findings were all but forgotten for the next 35 years when I—at first unaware of Gunn's work—called attention to them again and demonstrated their close association with a systemic increase in the blood pressure. Gunn had suspected such a parallelism but was unable to prove it because, at that time, the knowledge of hypertension was only in its rudimentary stage. There existed hardly any equipment for the exact measurement of blood pressure.

While reviewing the literature for a lecture in 1927, I found in the Graefe-Saemisch Handbuch (Leber: Diseases of the retina) the names of my predecessors Gunn⁶ and

Raehlmann,⁷ as well as comments by Leber sharply expressing his disapproval of their theories.

There are two types of pathologic crossings that should be differentiated which I have named "nicking sign" (Kreuzungsdelle) and "arching sign" (Kreuzungsbogen). In the nicking sign, the vein is slightly indented by the crossing artery which causes the "nicking" (fig. 3) or even a very small arch that just corresponds to the width of the crossing artery (figs. 4 to 7).

In other instances, the vein deviates in a more or less obtuse angle as in an attempt to shun the crossing artery (fig. 7). In none of these forms do the veins show either a congestion distal or an attenuation proximal to the crossing. Some sketches (figs. 4 to 7) of the most frequent forms demonstrate these changes better than detailed descriptions.

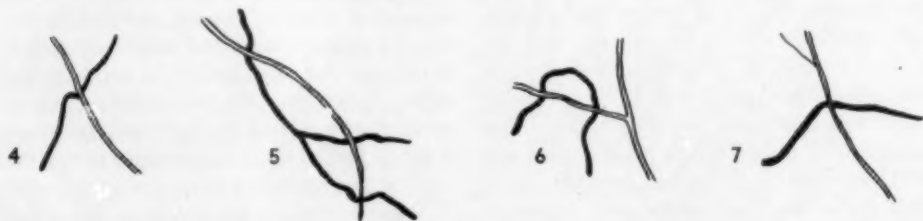
The diagnostic significance of the nicking and arching signs is that they occur almost regularly in the diseases under discussion and that, in spite of the variety of their forms, they are always so characteristic that they cannot be confused with congenital anomalies or other pictures of a different nature. Furthermore, the nicking is an early change that is occasionally well developed at a time when no other ophthalmoscopic or systemic changes can be demonstrated.

Some of the observations which I have made during the past few years demonstrate the value of the nicking phenomenon in an early diagnosis. In three cases my diagnosis

of arteriosclerosis was questioned because of negative findings but was corroborated in two instances after approximately one and one-half years, in one instance almost three years after other sclerotic changes in the coronary and cerebral arteries occurred.

The second pathologic form of crossing, the arching sign, is identical with the one already described by Gunn and Raehlmann. It differs in many ways from the nicking phenomenon. The vein shows a rather abrupt attenuation of several vessel widths to both sides of the crossing artery. It extends so far from the actual spot of the crossing that it cannot be explained as the result of pressure or weight due to the artery alone. The reflex stripe is missing in the attenuated part of the vein, the vessel itself appears somewhat indistinct, and its borders are blurred. The arch formed by the vein either extends into the depth of the retina (naturally, it appears straight in the sketch, fig. 8a) or the arch formed by the vein extends several vessel widths to one side at the point of crossing to return into its original direction. The artery appears at approximately the center of the arch (fig. 8b). In advanced cases, the attenuation of the vein is occasionally so extensive that the central section of the arch to both sides of the artery is invisible for a considerable distance, that is, the vein appears completely interrupted (fig. 8c).

The arching and nicking phenomena always occur in places where the circulation in the vein is impeded by the pressure or weight of the pathologically altered crossing



Figs. 4, 5, 6, and 7 (Salus). (fig. 4) Nicking sign. Blood pressure, 140/75 mm. Hg. (fig. 5) Three nicking signs. Blood pressure, 110/60 mm. Hg. (fig. 6) Two nicking signs. Blood pressure, 145/70 mm. Hg. (fig. 7) Nicking sign. Deviation of vein. Blood pressure 150/80 mm. Hg.

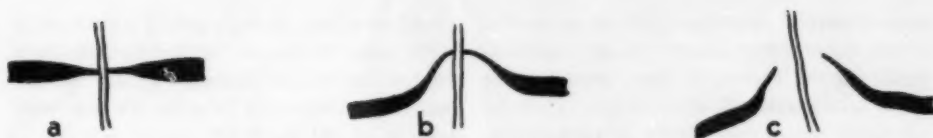


Fig. 8 (Salus). Arching sign. See text for explanation.

artery. In the early stages with a minimal impediment, there is only a superficial indentation of the vein or a very small arch corresponding approximately to the width of the crossing artery without evidence of congestion or attenuation. In more advanced cases, there is greater interference with the circulation. A displacement of the vein into the depth of the retina re-establishes free circulation. The deeper into the retina the vein is displaced (and, according to the anatomic investigations by Friedenwald and Guist, it can reach the outer nuclear layer), the more indistinct and the thinner will it appear; it can become invisible for quite a distance.

Even though this displacement of the vein into the retina takes place only gradually, it hardly ever occurs without some tissue reaction. Perhaps a diffuse clouding develops that may be partly responsible for the apparent thinning and veiling or even for the complete obscuring of the vein.

Not infrequently, one finds a series of punctate hemorrhages and, occasionally, a circumscribed slate-colored, superficial retinal edema surrounding the crossing point. These changes may well be the sequelae of a previous congestion that must have been present at a time before the vein deviated into the depth of the retina. Gunn also believes in a venous congestion in the distal section of the vein. However, it is an essential factor for this theory whereas, in reality, it is observed only very infrequently. In such instances, the distal part of the vein is notably distended and tortuous but shows a normal course and width proximal to the area of nicking or arching. I consider such cases as early stages of a developing arching phenomenon (fig. 9).

From the discussion so far, the reader may have the impression that I regard the nicking phenomenon as a suggestive or not fully developed arching phenomenon, that is, that both are different stages of one entity rendering my emphasis of the characteristics that differentiates the nicking from the arching phenomenon superfluous. There are indeed a series of details that seem to support such a point of view. For instance, arching and nicking phenomena occur not infrequently in the same fundus. Also, observation of an area of nicking over an extended period of time permitted me to note the gradual change from nicking to typical arching. Nevertheless, other cases of nicking were observed for quite some time, yet their characteristic appearance remained unchanged. In further consideration, there are numerous cases which leave one in doubt as to whether they are instances of nicking or arching, so one may indeed favor the conclusion that the two phenomena might be closely related, if not identical.

However, the well-founded experience that a fully developed arching phenomenon is a definite sign of an established hypertension, whereas the nicking phenomenon may or may not be associated with hypertension, is a useful argument against their complete identity. At least for diagnostic reasons, one should attempt to observe these different signs and to distinguish between the two clinical pictures if possible.

I have already emphasized and proved¹ that Gunn's sign is not caused by high blood pressure but is a result of the vascular changes. The hypertensive changes, or rather the interference with circulation caused by them, should be differentiated from arteriosclerotic changes. The former cause the

vein to deviate into the depth of the retina at the point of crossing (Gunn's arching sign). In the typical nicking phenomenon, there are arteriosclerotic changes. If it is the initial stage of arching, it is due to minimal early hypertensive vascular changes that cause only an insignificant interference with the circulation, not intense enough to result in a deviation of the vein into the depth of the retina.

It would lead too far to discuss here in detail the well-known differentiating signs between hypertensive and arteriosclerotic vascular changes. The instance that I just discussed was merely one facet to illustrate the contrast between the two processes which, true enough, are overlapping.

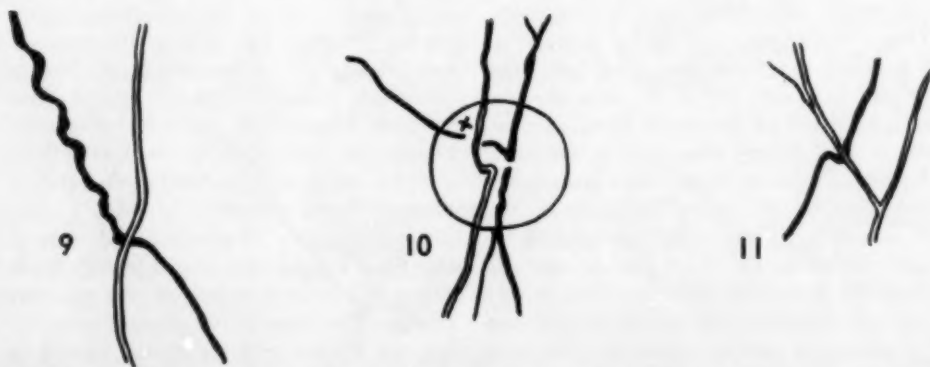
I would like to cite one exception to the rule I just formulated—that the true arching phenomenon proves the presence of fixed hypertension. In a concentration camp during World War II, I saw arching signs in some patients with normal or even sub-normal blood pressures that were checked repeatedly. All of these patients admitted that they had suffered from high blood pressure for years but that their old ailments had been cured by the "strict" diet. Without exception, these patients suffered from extreme malnutrition. Those that I could follow died within a brief period of time. This is

proof, as was to be expected, that an arching sign, once developed, is irreversible even though the blood pressure should become reduced considerably. In cases of this nature, the fall of the blood pressure is not a "recovery." It occurs because the heart, weakened by hunger, lack of protein, and stress of all sorts, has not the strength to maintain the necessary pressure.

So far there have been no reports that typical arching signs occur on the disc itself. Those arching signs that I saw could be well differentiated from similar pictures (like the disappearance of a vein in an excavated disc or a congenital funnel-shaped disc) because the crossing artery was visible at the point of crossing of the veiled, the attenuated, or the even completely interrupted vein. In none of these cases was there any evidence of functional disturbances (fig. 10).

Perhaps it would be appropriate to mention here the rare picture in which the artery does not cross the vein but where this pattern is reversed. In pathologic cases, the vein forms a more or less steep arch over the artery whose reflex stripe is indistinct or disappears (fig. 11).

In a recent publication Biró⁸ discusses in detail this "inverse" type of crossing that received little attention in the past. He notes that in cases of advanced hypertension the



Figs. 9, 10, and 11 (Salus). (fig. 9) Blood pressure, 200/120 mm. Hg. (fig. 10) Blood pressure, 235/135 mm. Hg. (fig. 11) Blood pressure, 170/95 mm. Hg.

veins show various changes in their course that correspond approximately to the arching phenomenon except for the inverse relationship. In spite of his small number of 27 cases, it can be stated that the changes in the course of the vein in inverse crossing afford reliable data for the diagnosis of an established hypertension.

Ophthalmoscopy under digital pressure has not revealed significant points as far as the crossings are concerned. In crossings near the disc, one can cause first the collapse of the vein and then of the artery, another proof for the already known fact that neither the artery nor the vein shows any evidence of opacities in its wall.

Irregularities of the lumen of the arteries, the so-called caliber variations, should be listed as another change. Except for the rare cases of irregularities due to circumscribed spasm or aneurysmatic dilation, they are sclerotic in nature, and thus of great diagnostic significance. In some cases with irregularities at or near the disc, a distinct circumscribed thickening of the walls becomes evident in the form of gray shadows during ophthalmoscopy under digital pressure. Occasionally I saw wedgelike or spurlike structures (perhaps proliferations of the endothelium) penetrate directly into the lumen of the artery and cause its narrowing. Pronounced caliber variations occur as a rule only in advanced cases and belong to the rare findings.

The occasional occurrence of glistening deposits of lime or cholesterol crystals in the vessel wall itself or in the retina is unimportant for the diagnosis of the diseases with which we are concerned here; the deposits are quite rare and their significance is not quite clear. At times I have seen such crystals even in children or healthy adolescents and feel that, at least part of the time, they are congenital.

Tortuosity of the retinal vessels—either arteries, veins or both—is an equivocal sign and should be used only with great caution in the ophthalmoscopic diagnosis of hyper-

tension and arteriosclerosis. According to the investigations of H. Gauss⁹ such tortuosities occur in 30 percent of normal cases. Tortuosity of the retinal arteries in particular has not the great value in the diagnosis of arteriosclerosis that has been attributed to it. Tortuosity of the veins is frequently congenital but is also seen in decompensated or advanced hypertension, in blood dyscrasias, and in congestion of a systemic or localized nature. Thus, as an isolated finding, tortuosity of the veins is not a reliable diagnostic sign.

Only two forms of tortuosity of the veins are pathognomonic. The first has been described already in cases of the arching phenomenon with a distinct dilation and tortuosity (congestion) of the distal section of the vein. The second form is a corkscrewlike tortuosity of the fine capillaries, especially in the foveal region (Guist's sign) which I shall discuss later.

WIDTH OF VESSELS

I have mentioned elsewhere⁸ that the large retinal arteries are usually normal (occasionally perhaps somewhat dilated) in early hypertension, whereas the smaller peripheral arteries are more or less constricted. As the disease progresses, this constriction becomes more and more noticeable so that in advanced cases of long standing even the arteries near the disc show distinct narrowing while the peripheral arteries are constricted to such an extent that, in indirect ophthalmoscopy, at first glance only the veins are visible but the threadlike arteries can be made out with great difficulty. The narrowing is most pronounced in the foveal arterioles, a point to be discussed later.

ACCOMPANYING STRIPES, SHEATHING

The congenital forms of the so-called accompanying stripes have already been mentioned. Other forms that involve mostly the veins are usually sequelae of an inflammatory vascular process or of circulatory

disturbances. Frequently they are minor degrees of changes which, if fully developed, appear as fine white strands and threads that occasionally form a delicate lace work. To avoid repetition, I refer to the section on "reflexes" where these changes were discussed in detail.

The finding of retinal hemorrhages, exudates, the various forms of retinal edema and papilledema—though of great clinical and prognostic significance—does not permit direct conclusion as to their etiology; although they are seen most frequently in hypertension and arteriosclerosis, they are also associated with a number of other conditions. Here the diagnostic value of the crossing phenomena is particularly helpful. If the signs involving the retina or optic nerve that have just been enumerated are combined with the characteristic crossing phenomena, they are most probably caused by advanced hypertension or arteriosclerosis. The reverse is true in the absence of crossing phenomena. Of course, in all these cases a careful general examination is imperative.

FOVEA CENTRALIS

Changes typical for hypertension are particularly frequent and pronounced in the foveal vessels. The reason is that the first and most important changes, especially in hypertension, involve the arterioles. The minute foveal vessels just visible are of this magnitude.

The peculiar distribution and arrangement of the foveal arterioles cause characteristic changes not seen elsewhere in the retina. I described the vascular distribution in the fovea centralis for the first time in 1939.⁵ To avoid repetition, I shall mention here only facts that are essential for the understanding of the pathology of these vessels. There is an arc of vessels closer to the fovea and parallel to the larger arc formed by the superior and inferior temporal branches of the central retinal vessels. The superior and inferior perifoveal arteries and veins participate in the formation of this arc. Their

width gradually decreases. Together with the macular vessels originating from the disc they take a radial course toward the fovea, giving off a large number of fine vessels.

It is natural in such an arrangement to find numerous crossings between arteries and veins. Typical nicking and arching signs are seen only among the larger vessels of this area in patients with hypertension and sclerosis. Corresponding changes for the remainder of the crossings are either completely missing or are limited to slight changes in the course of the vessels. Slight indentations of the veins are often so insignificant that they might be considered coincidental were it not for the crossing small artery that is often difficult to see but that can be recognized as the cause for the change of course of the vein.

The arrangement of the foveal arteries and veins converging from all sides toward the fovea is such that there is a strict alternation between arteries and veins. Even if two similar vessels branch off very closely from a perifoveolar artery or vein, a dissimilar vessel interposes itself between the two a brief distance after its origin, maintaining the correct sequence of arteries:veins toward the foveola. This pattern which I have called the "law of sequence" (*Gesetz der Aufeinanderfolge*) probably applies not only to the foveal vessels but to all circumscribed areas of small vessels, that is, each efferent artery alternates with an afferent vein. In counterdistinction to other locations this arrangement becomes more obvious in the fovea centralis because of the characteristically regular arrangement of the vessels and because it is possible to differentiate arteries from veins even in their smallest branches.

I have pointed out that the attenuation of the retinal arteries increases toward the periphery in hypertension. The foveal arteries are no exception in this respect. In advanced hypertension only small segments or no vessels at all are visible. If visible, they seem to terminate at a greater distance than usual

from the fovea. While the average number of foveal arteries and veins is 16, predominantly veins remain visible in the immediate vicinity of the foveola in cases of hypertension, thus causing a considerable reduction of vessels converging toward the foveola. Therefore, the "law of sequence" becomes invalid: there is no longer alteration between arteries and veins, but only veins remain, with an isolated artery few and far between.

As a rule, the regular radial course of the small foveal veins changes: they are mostly tortuous, with their fine terminals assuming a corkscrewlike appearance (Guist's sign). This completes the clinical picture of what I have called "fovea hypertonica."

These far-reaching changes can be appreciated in their full significance only if one compares them with the regular and delicate vessel pattern in the intact fovea of young persons. It is not unusual to see sections of vessels in the pathologic fovea which show an increase of their reflex or whitish sheathing (remnants of pathologically altered pre-arterioles or arterioles) appear or disappear abruptly. Occasionally one finds capillary or precapillary aneurysms that resemble minute punctate hemorrhages or, more rarely, actual hemorrhages of varying size. Finally there are pigmentary changes and small foci of degeneration.

The diagnostic value of the vascular changes in the fovea does not quite correspond to their variety and the frequency with which they occur. Only if the fully developed picture of the fovea hypertonica is present is one justified in assuming the presence of hypertension of long standing. In all other instances there are only differences of degree of sclerotic changes. Even the vessels of the senile fovea centralis, beginning at the age of about 50 years, show similar changes (except crossing signs) though less developed, for example, irregularities in the vessel distribution, tortuosity of small veins, furthermore a more or less distinct attenuation and shortening of the smallest arteries

with regression from the foveola.

So much for the theoretic considerations. There should be clinical investigations along the lines outlined in the beginning to determine whether application of the principles expressed here would yield more satisfactory results than in my original series. It would be interesting to find out whether some or most of my mistakes could be avoided. At present I am in no position to carry out this work. From practical experience throughout many years it seems to me that any accuracy in the diagnosis of these vascular conditions leaves much to be desired. Such accuracy could become a reality only if one would limit oneself to the infallible criteria but exclude ambiguous and, therefore, misleading signs.

I, for one, cannot agree with the standpoint taken by some authors who believe that they can estimate the rate of the blood pressure or even the life expectancy of the patient from the appearance of the retinal vessels, particularly the crossing signs. Nevertheless, there is a certain parallelism between the appearance of the vascular tree of the retina and the severity of the underlying systemic condition. It has not always been taken into account that crossing phenomena are not present a priori but develop gradually in the course of the illness, and that there are early and old forms present simultaneously. The process of this development depends mainly on the nature of the systemic involvement.

Repeated recordings (either sketches or photography) of one or several crossings should give some idea whether the basic disease is favorable or unfavorable, at what rate it progresses, or whether it is stationary. The effect of certain therapeutic measures might also be studied.

There is a definite advantage in such serial examinations carried out over an extended period of time. It would also permit the study of the manner in which the crossing phenomena develop, in particular the rate and the change from one stage into another,

facts that have been subject to speculation only.

It would be a rewarding topic of investigation for some young ophthalmologist who would be willing to spend some time, perhaps years, to gather sufficient material for statistical purposes. He should expect some patients to die and others not to return for various reasons; his efforts in behalf of these cases will have been wasted.

I, myself, have undertaken such investigations for more than one year. The meager results of these investigations were the basis for the general statements regarding the occasional transition from nicking to arching phenomena. The original number of 14 crossings in seven cases had decreased to two cases after one year; all others had disappeared.

One of the reasons for this publication is to stimulate interest for similar investigations on a larger scale. This might provide material to help in answering some yet unanswered questions.

SUMMARY

An attempt has been made to demonstrate that a number of findings on which the ophthalmoscopic diagnosis of hypertension and arteriosclerosis is based are unreliable and often misleading.

The pathologic changes at the crossings of arteries and veins which occur in the form of the arching sign (Gunn's sign) in hypertension of long standing, or in the form of the nicking sign (Salus' sign), mostly in arteriosclerosis or as the early stage of the arching sign, are regarded as absolutely reliable diagnostic points.

Caliber changes of the arteries, Gunn's silver wire arteries, and the fovea hypertonica also appear to be pathognomonic but occur less regularly.

Ophthalmoscopy under digital pressure that interrupts circulation temporarily makes it possible occasionally to gain more definite data on the condition of the vascular walls.

Via Andrea Doria, 32.

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RETINITIS: PIGMENTOSA OR RUBELLA?*

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INTRODUCTION

I presume that every physician, like myself, is plagued day in and day out by the justifiably concerned queries of patients regarding the precise natures of their diseases, the exact reasons for their particular symptoms, and the definite outlooks or prognoses for the immediate and remote future. Those diseases, the diagnoses of which can be specific and definite, offer no stumbling block to concise and particular advice. But those diseases which are mantled with confusion, whose differential diagnoses merge imperceptibly from one clinical entity into another clinical entity, and whose prognoses are dramatically at variance, make the uneasiness of the physician acute, and the prognostication to the patient a difficult task.

The purpose of this paper is to emphasize the existence of a generally unfamiliar, relatively benign, clinical entity whose characteristics resemble, in many respects, an entirely different disease entity with a malignant prognosis; both diseases are frequently associated with congenital deafness. This unfortunate combination of circumstances, when encountered in an infant or young child, places a tremendous responsibility on the attending ophthalmologist in advising and reassuring the parents. A wrong diagnosis may result in transmitting to them the unjust sentence for their child of ultimate blindness superimposed upon the already disturbing defect of deafness.

The particular diseases in question are deafness with retinitis pigmentosa (primary pigmentary degeneration of the retina) and deafness with maternal rubella retinitis. Seven cases will be presented to illustrate the syndromes under discussion. These cases

have been encountered during routine examinations of the children of the Rochester School for the Deaf over the past five years. Since it became my duty to take over the ocular examinations of the school children, I have established the policy of doing cycloplegic refractions and funduscopy on all new admissions, in addition to the usual external examination. A large number of pupils already enrolled in the school at the time of my appointment have not been screened in the same manner. As has been noted in another recent review,¹ the incidence of ocular anomalies, refractive and organic, is significantly higher in deaf children than in the general population of the same age group.

RETINITIS PIGMENTOSA

I shall not go into detailed repetition of the description of this well-established entity, since an excellent account can be obtained from any standard textbook of ophthalmology. In brief, this disease has the following ophthalmologic features: (1) a characteristic waxy pallor of the optic discs; (2) marked attenuation of the retinal arterioles; (3) characteristic pigment deposits within the retina whose shape is classically described as "bone-corporuscle." Elwyn² does not offer an explanation for the attenuation of the vessels but ascribes the pigment deposits to the migration of retinal pigment epithelium (proliferated) cells to the degenerated and destroyed rods and cones.

The hereditary aspects of this disease are well recognized, and the modes of inheritance vary from Mendelian recessive to dominant, with sex-linkage demonstrated in some instances. Duke-Elder³ states that the disease is "rarely manifest at birth" (which implies that it may be present at birth), and that it "becomes apparent in childhood." In the same account he writes:

* Aided by the Rochester Eye-Bank and Research Society. This paper was awarded a prize by the Rochester Academy of Medicine, May 7, 1957.

"It is exceptional for the disease to be evident at that time (birth). . . . Cases, however, have occurred when children have been born blind or have gone blind in early infancy, and night blindness is commonly found as early as such a symptom can be elicited. In the great majority of cases pigmentation is clinically evident between the ages of three and eight years, at the end of which time it may be quite advanced. Usually serious symptoms begin to be apparent in school life (six to 12 years) and by 20 years of age they may begin to be incapacitating."

Of import to this study is the frequency of associated degenerations, among which are myopia, mental inferiority or insanity, epilepsy, pituitary dysfunction, color defectiveness, and deafness and mutism. I wish to point to the parallel associated findings in the description of the disease to follow. Of possible interest is the statement that the initiation or acceleration of this disease has been associated with severe illnesses, among them the exanthemas.

The following facts should be kept in mind, for, although they may be atypical, they enter into consideration when the various aspects in the differential diagnosis of maternal rubella retinitis are being weighed:

1. Retinitis pigmentosa is almost always bilateral but unilaterality has been reported.⁸

2. The pigmentary changes may be limited in degree or completely absent. (Classical pictures in textbooks tend to give the impression that the pigment deposits are always symmetric and generalized.)

3. The pigmentary disturbances may either be spiderlike clumps or scattered black dots.

4. The pigment distribution sometimes "takes the form of an island around the macula. In these cases central vision is much damaged."⁹

It is obvious that, although the disease almost invariably comes to the attention of the ophthalmologist in later childhood or in early adult life, the presence of deafness may concentrate ophthalmologic care on the child at a very early age and the early and "atypi-

cal" aspects of the disease can take on a major significance in the differential diagnosis.

MATERNAL RUBELLA

In 1941, attention was focused on the relationship of rubella in the first trimester of pregnancy to congenital defects in the newborn. Gregg⁴ reported 78 cases of congenital cataracts following an epidemic of rubella in Australia during World War II. Sixty-eight of these cases showed cardiac anomalies. Swan, et al.⁵ reported 61 maternal rubella cases, of which 41 had congenital defects. A very common characteristic was a light birth weight. Of these cases, 15 had congenital cataracts, one buphthalmos, three microphthalmos, 21 cardiac abnormalities, 15 microcephaly, one hypospadias, one obliteration of bile ducts, one talipes quinovarus, several mental defectives, and 12 deaf-mutes.

The average period of gestation at the time the disease was contracted, in the cases with deafness, was two to three months. These authors concluded, with corroboration by other reports since then, that when the mother definitely contracts rubella during the first two months of gestation, congenital defects will be present in about 100 percent of the cases; when the disease is contracted in the third month, 50 percent of the offspring develop congenital anomalies.

This extremely high incidence of serious anomalies has prompted responsible and humanitarian physicians to recommend therapeutic abortion in those cases in which the mother is definitely known to have contracted rubella during the first three months of pregnancy. To combat the dread complications, recommendation has also been made that girls should be deliberately exposed to the disease at some time prior to the child-bearing age.

Embryologically, it is interesting to note that⁶ at five weeks the embryo is 12 mm., at seven weeks, 25 mm. The preliminary lens fibers begin at about the 12-mm. stage. The

ganglion cells develop at about the 17-mm. stage, the rods and cones at the 21-mm. stage, and the iris stroma at the 18-to 20-mm. stage. Mann⁷ points out the relationship between the time of onset of maternal infection and known times of active proliferation of lenticular, cochlear, and cardiac primordia and applies the same thinking to the pigment epithelium of the retina.

Rubella, or German measles, or three-day measles, is an exanthematous contagious disease with mild constitutional symptoms, caused by a filterable virus. One attack protects the individual for life.

Characteristically, the adult complains of few or no constitutional symptoms. Among the inconstant symptoms noted, and lightly dismissed, are headache, stiffness of joints, and slight lassitude. Mild catarrhal and pharyngeal symptoms may be present at the onset. Often a morbilliform rash on the chest, arms or forehead is noted, or a characteristic postauricular lymphadenopathy may be present. Postcervical and postoccipital lymphadenopathy are also frequent.

The relatively benign and inconspicuous signs and symptoms make anamnesis a difficult task. Six months or several years later, when the physician, suspecting an intra-uterine rubella infection, queries the mother about nondescript symptoms and signs, her answer frequently can be no more than a guess.

Long and Danielson⁸ reported six patients with congenital cataracts, all of whom had cardiac defects. The mothers had regarded their disease as trivial. The birth weights varied from four and one-half to six and three-quarters pounds. In three cases the cataracts were unilateral, allowing a view of the opposite fundus, and each of these non-cataractous eyes "showed . . . diffuse pigment alteration in the fundus, suggestive of changes resulting from chorioretinitis." Case 1 was described as "the entire posterior pole showed a diffuse mottled pigmentation as though from a mild chorioretinitis." Case 2, as "some diffuse mild pigmentary distur-

ance." Case 4, as "diffuse pigmented mottling of the fundus with the greatest irregularity of pigmentation in and temporal to the macular region."

Prendergast⁹ reported a personal communication from T. L. Terry describing the eyes (obtained at autopsy) of a baby with bilateral cataracts, the chief features of which were bilateral cataracts, small ganglion cells, a poorly formed meshwork in the angle, and failure of the anterior surface of the iris to produce the usual crypt formation. The rods and cones were poorly developed. Prendergast also summarized the findings in 40 cases for which questionnaires were returned by pediatricians. In only two of these 40 cases was pigmentation of the retina reported. These figures, however, did not tell in what percentage of the reported cases fundusoscopic examinations were actually performed, nor did the author mention whether mydriatics were used.

Gregg⁴ reported retinal pigment changes in 16 of 52 cases, and felt that the fundus picture was typical. He uses the descriptive terms, "measly or blotchy pigment," "macular," three to four disc diameters in extent, and "discrete."

Swan⁵ reported "multiple small pigmented spots on the fundus." Alarcon¹⁰ stated that, in maternal rubella a "pseudoretinitis pigmentosa" exists.

Cordes,¹¹ in a discussion of relationship of rubella in the mother to congenital cataracts in the child, cites two cases with clumped and scattered pigment particles throughout the fundus but predominantly in the foveal areas and, in some places, covering the retinal vessels. Except for the normal-appearing vessels, the whole picture, to him, suggested retinitis pigmentosa. Ellet in the same discussion¹¹ described the fundus as being pigmented, as in congenital syphilis. Terry¹¹ also noted pigmentary changes, minute in size and similar in form and distribution to those of retinitis pigmentosa.

Marks¹² reported 17 abnormally pigmented fundi of 38 children with congenital

deafness following maternal rubella. In a larger series of 101 deaf children examined, 27 had abnormally pigmented fundi and, of these 27, 21 had a definite history of maternal rubella. He emphasizes that the absence of a history of maternal rubella does not exclude the possibility of mild and undiagnosed forms of the disease. His description of the pigmentation is "an atypical retinitis pigmentosa, not of the bone corpuscle form but coarsely mottled, with normal blood vessels, and vision not affected sufficiently to interfere with school work."

Blankenstein and Feinman¹³ reported four cases in which practically the only ocular abnormality was a "highly diagnostic" pigmentary disturbance of the macula. Case 1 had a mottled black pigmentation at the posterior pole, approximately four disc diameters in size, between the superior and inferior vessels, extending to the edge of the disc. The blotches of pigment which were larger in the middle measured 1.5 vein diameters, were slightly irregularly round in shape, and decreased in size peripherally where they faded into dustlike spots and well-demarcated, tightly packed granules. The optic papilla appeared normal. No foveal reflex was noted. No changes appeared over a period of seven years.

In Case 2, described by Blankenstein and Feinman, the child was deaf. The pigmented area was central and the pigment was granular and blotchy, the larger blotches being one-vein diameter in size. In their Case 3 the right fundus appeared normal; the left fundus had the same appearance as that of Case 2. Their Case 4 also showed a non-progressive deafness. In the inferior temporal quadrant of the right eye, was a uniformly diffuse, fine, dustlike pigmentation.

Blankenstein and Feinman noted that the visual acuity was relatively unaffected, that no progression was observed, that two cases were unilateral, that the characteristics of the pigment deposits were "blotchy," discrete pigment spots, fading peripherally, that the pigment was deep, and that the

posterior pole gave the impression of a central elevation.

I should like to emphasize that, in all of the cases just cited, no mention was made of alterations in the choroid.

Stockwell¹⁴ made a survey of visual defects in 960 deaf children over a 10-year period. Only those children with symptoms received a cycloplegic examination, so that an asymptomatic pathologic alteration could have escaped attention. In this series were found 23 cases of what she called retinitis pigmentosa or pigmentary degeneration of the retina. No mention was made of a pigmentation like that following a maternal rubella retinitis.

Parenthetically, it should be mentioned that other diseases may simulate the picture of rubella retinitis, as Walsh¹⁵ illustrated in a 14-year-old girl, who had contracted rubella (measles) at six years of age, "whose fundi were similar to what is seen in retinitis pigmentosa. There was pronounced contraction of the visual fields with only a small island remaining close to the fixation points in the nasal fields." At the time of the disease the child had been totally blind, with gradual improvement over the next month.

CASE REPORTS

The following seven patients, all deaf and all students of the Rochester School for the Deaf, are reported because their cases are related to the subject under discussion. Questionnaires were sent to the mothers of the children for first-hand information; three questionnaires were not returned.

CASE 1

S. M. F., a white girl, was first seen at the age of three years (1956). She was a full-term child with a birth weight of seven lb. seven oz. The Wassermann test was negative. The cause of deafness on the school record was German measles.

Associated findings were that the child's heart valves were slow to close at birth.

The mother stated that between six and eight weeks' gestation, she had developed a rash over entire body, especially chest and face. Three weeks previously her eldest daughter had had the disease. Diagnosis was corroborated by a physician.



Fig. 1 (Emerson). Findings in Case 1.

At time the following data were obtained, the patient was three years of age.

Refraction (atropine). R.E., -1.0D. sph. \ominus -1.0D. cyl. ax. 180°, visual acuity not determinable (too young); L.E., -0.5D. sph. \ominus -1.0D. cyl. ax. 90°, same as for R.E.

External examination showed normal adnexa, clear corneas, pupils equal and round, with normal direct and consensual light reactions, media clear.

Irises (fig. 1). Both were varicolored, presenting a darker blue color peripherally, blending into a gray-blue centrally. Toward the pupil margin the stroma thinned so that the brownish color of the pigment epithelium became visible.

Fundus. The right fundus was grossly normal, with considerable water-silk reflexes of the posterior pole. The left showed moderate dyspigmentation of the posterior pole and inferior portions, with a mottled, granular pigmented appearance against a slightly depigmented background. No "bone corpuscle" deposits, as such, were seen.

CASE 2

C. C. LaF., a white girl, was first seen at the age of seven years (1950). She was born after eight months' gestation with a birth weight of five lb. The Wassermann test was negative. No cause of deafness was noted on the school record. There were no associated findings. Menses began at the age of 11 years. The mother gave no history of German measles.

Age at time the following data were obtained, 14 years.

Refraction (Cyclogyl). R.E., +6.0D. sph. = 6/12; L.E., +4.75D. sph. \ominus -2.5D. cyl. ax. 50° = 6/7.5.

External examination showed normal adnexa; corneal diameters of 10 mm., both eyes; pupillary reactions prompt to direct and consensual light stimulation, round and equal. An intermittent exotropia, variable in amount, was present.

Irises (fig. 2). Both irises revealed relatively normal peripheral iris stroma with crypt formation but the middle and pupillary portions showed a marked hypoplastic stroma, through which the iris pigment was grossly visible.

Slitlamp. Iris hypoplasia and pigment epithelium were seen.

Fundus. The disc of the right eye was normal. Arteriovenous relationships were within normal limits. Immediately adjacent to the disc, within one-half disc diameter and surrounding the inferior half of the disc, were numerous, clumped, sharply defined, dense, black pigment aggregates, some of which had a corpuscular morphology. There was no associated choroidal change. The macular area was diffusely involved with a sprinkled type of retinal pigment deposit. There was no choroidal atrophy. However, four disc diameters temporal to the macula was an extensive zone in which sharply circumscribed white dots were visible. These were also small, not coalesced, and resembled neither exudates nor drusen. The diffuse retinal pigment disturbance was present in all quadrants, although in variable quantity and density. The best descriptive term for the pigment would be, perhaps, powdery pigmentation with larger clumps.

The left eye showed slight blurring of the disc margin, with good color and normal arteriovenous configuration. There was a much more extensive deposit of dense coalesced pigment along the temporal half of the disc margin with aggregate pigment adjacent to it. The nasal half was bordered by a band, approximately one-half disc diameter in width, of clumped pigment, much of which resembled corpuscular deposits. No gross choroidal change was visible in this area. The macular region appeared similar to that of the right eye, as did the periphery. Considerable tessellation of the periphery was noted. The pigment deposits extended diffusely into the periphery but were most prominent at the posterior pole. White, subretinal, punctate dots were also present.

A comparison of findings after two years with those of the first examination showed no progression.

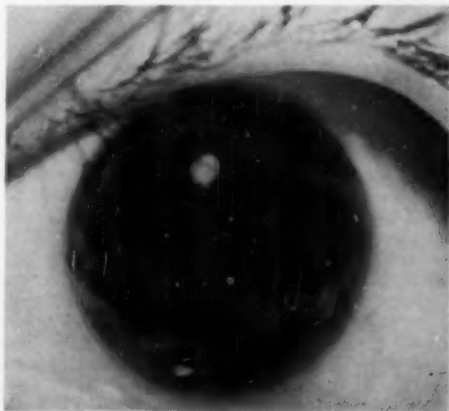


Fig. 2 (Emerson). Findings in Case 2.



Fig. 3 (Emerson). Findings in Case 3.

CASE 3

D. LeV., a white boy, was first seen at the age of six years (1955). He was a full-term child with a birth weight of five lb. The Wassermann test was negative. The cause of deafness on the school record was virus pneumonia at six weeks of age. There were no associated findings. The mother did not return the questionnaire.

Age at time the following data were collected, eight years:

Refraction (Cyclogyl). R.E., +2.0D. sph. \ominus -0.5D. cyl. ax. $180^\circ = 6/6$; L.E., +4.0D. sph. \ominus -1.75D. cyl. ax. $45^\circ = 6/6$.

External examination showed normal adnexa, corneal diameters of 10 mm. both eyes. Pupils were equal, round, and reacted to direct and consensual light stimulation. (The right pupil had a very slight horizontally ovoid shape on close scrutiny.)

Irides (fig. 3) were of a diffuse brownish color with lack of iris crypt differentiation, although some crypts were present.

Slitlamp. Iris surfaces and crypts were very irregular with several areas of iris atrophy or hypoplasia, through which the underlying iris pigment epithelium was prominent. The stroma crypts were very small and "stipply," especially inferiorly.

Fundus. In the right fundus, the disc had a slightly pallid appearance with some perivascular glial sheathing. The temporal margin appeared to be slightly elevated. There was diffuse mottled dyspigmentation of the entire posterior pole, more prominent in the region of the macula. The pigment disturbance appeared to be more within the pigment epithelium layer and was not characterized by definitive, isolated pigment deposits with corpuscular characteristics. The posterior pole was predominantly involved. The retinal vessels were questionably narrow.

In the left fundus, the disc revealed the same suggestive diffuse pallor with slight structural

blurring. The macular area was similar to that of the right eye but also had one rounded, dense, black deposit within the retina, pinhead in size with a halo of depigmentation, and localized to the retinal pigment epithelium level. Occasional scattered areas of pigmentation were found in the periphery.

Two years after the first examination there was no change.

CASE 4

D. M. D., a white girl, was first seen at the age of eight years (1952). She was a full-term infant, with a birth weight of five lb. 13 oz. The Wassermann test was negative. Cause of deafness was listed on the school record as there being a possibility that the mother had had German measles while pregnant. There were no associated findings. Menses began at the age of 10 years. The mother did not return the questionnaire.

At the time the following data were collected the patient was 12 years of age:

Refraction (Cyclogyl). R.E., +0.25D. sph. \ominus -2.0D. cyl. ax. $180^\circ = 6/6$; L.E., -2.25D. cyl. ax. $5^\circ = 6/6$.

External examination showed normal adnexa. Corneal diameters were 10.5 mm., both eyes. Pupils were slightly ovoid horizontally and reacted to direct and consensual light stimulation.

Irides (figs. 4 and 5) showed a light-brown, diffuse color with sectoral stromal atrophy, through which the underlying iris pigment epithelium was grossly visible and transillumination was easily demonstrable. A radial, slitlike hole in the 9-o'clock midperiphery of the right iris was easily visible.

Slitlamp. The iris stroma was very thin bilaterally and consisted of fine, lacy strands with multiple, stippled, shallow crypts.

Fundus. The disc of the right eye had a good color. Vascular architecture was normal. There was a diffuse, dense conus of pigment nasally and tem-

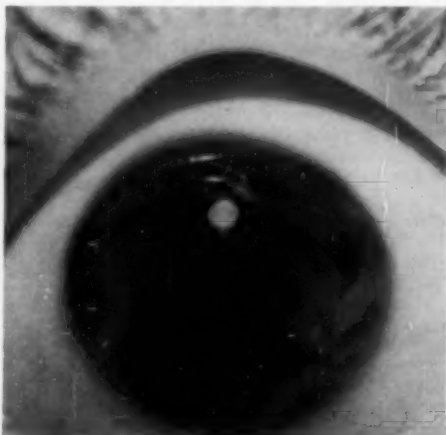


Fig. 4 (Emerson). Findings in Case 4.

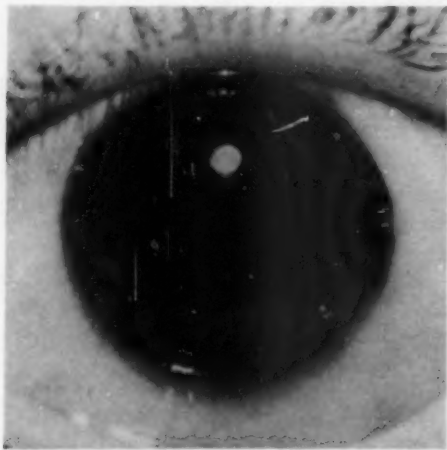


Fig. 5 (Emerson). Case 4. A radial slitlike hole was visible in the 9-o'clock midperiphery of the right iris.

porally. The posterior pole showed no significantly abnormal findings except for slight hypopigmented mottling in the region of the macula. There were many diffuse, water-silk reflexes at the posterior pole. In the superior midperiphery was an extensive zone of diffuse mottling, with granular and corpuscular pigment deposits. This area appeared to be associated with a staphyloma, inasmuch as the macula was seen most clearly with a $-2.0D.$ sph., and the area mentioned was seen best with a $-5.0D.$ sph. The pigmentary changes blended temporally into more normal retina.

The left fundus gave a similar picture. The posterior pole was clear. There was mild dyspigmentation in the midperiphery nasally without definite corpuscular deposits.

Comparison of the findings at the first examination with that four years later showed no change in the appearance of the fundi or the areas of iris atrophy.

CASE 5

P. V., a white girl, was first seen at the age of 14 years (1950). The Wassermann test was negative in 1949, 1955, 1956. No cause of deafness in school records. The mother denied German measles or any other illness during the first trimester of pregnancy.

Ages at time the following data were collected were 14 years to 18 years:

Refraction (Cyclogyl). R.E., $+2.25D.$ sph. \odot
 $-2.0D.$ cyl. ax. $5^\circ = 6/6-$; L.E., $+2.5D.$ sph. \odot
 $-0.5D.$ cyl. ax. $180^\circ = 6/18.$

By *external examination* the adnexa were normal. Pupillary light reactions were normal. With correction, there was a left esotropia of approximately five to 10 arc degrees, at 6.0 m. and 33 cm.

Iris. No abnormalities were noted. (This pa-

tient had graduated by the time of this study so that detailed points of interest could not be confirmed.)
Media were clear.

Fundus. The optic discs were suggestive of a waxy pallor. My note states: "Has peculiar tessellated fundi with sprinkling of groups of scattered pigment deposits, not corpuscular. Left macular region involved. Larger vessels fair in caliber; smaller vessels quite narrow."

Peripheral fields. When the patient was first seen, fields were difficult to obtain but there appeared to be a fairly consistent bilateral contraction of the 10/330 white and 2/330 white isopters, both of approximately the same size.

When the patient was first seen, the differential diagnoses considered were: (1) retinitis pigmentosa, (2) luetic retinitis, (3) rubella retinitis (maternal).

Course. The clinical picture did not change over a period of five years.

CASE 6

R. W. R., a white boy, was first seen at the age of eight years (1952). The Wassermann test was negative. No cause of deafness was noted on the school records. The mother stated that she had had German measles between the second and third months of pregnancy and her statement was confirmed by her physician.

Age at time the following data were collected was 11 years.

Refraction (Cyclogyl). R.E., $+4.5D.$ sph. \odot
 $-0.5D.$ cyl. ax. $180^\circ = 6/7.5$; L.E., $+3.5D.$ sph. $= 6/6-$.

External examination showed normal adnexa. The pupillary light reactions were normal.

Iris. The stroma was sparse, with the pigment epithelium visible in areas on direct and slitlamp observation. Media were clear.

Fundus. The discs were suggestively pale. Both fundi revealed a diffuse, granular pigmentation which involved the macular regions as well.

No change was noted during three years.

CASE 7

P. H., a white girl, was first seen at the age of 15 years (1950). The Wassermann test was negative. No cause of deafness was noted on the school records. Her mother did not reply to the questionnaire.

Age at time the following data were collected was 19 years:

Refraction (Cyclogyl). R.E., $+3.75D.$ sph. \odot
 $-2.5D.$ cyl. ax. $15^\circ = 6/9 \pm$; L.E., $+3.0D.$ sph. \odot
 $-2.5D.$ cyl. ax. $172^\circ = 6/7.5-$.

External examination showed normal adnexa except for a slight ptotic appearance, possibly due to habitual squinting (patient refused to wear correcting lenses). The pupillary light reactions were normal.

Iris. No notation was on the record; presumably normal. Media were clear.

Fundus. Discs were mildly pallid. The retinal vessels appeared definitely but mildly attenuated.

The retina itself showed granular, punctate, glistening reflexes associated with degenerative change, especially at the posterior pole. Macular regions were ruddy in color. Scattered in the midperiphery were typical pigment conglomerations, corpuscular in shape.

The patient has presented symptoms of hemeralopia. Although she was advised to return for field studies at her last visit, she failed to keep her appointment.

COMMENT

The cases presented illustrate the difficulties encountered in the differential diagnosis of retinal lesions in the young deaf child. However, there are suggestive features which make a presumptive diagnosis more accurate. Of all the cases listed above, I believe that only Case 7 (and possibly Case 5) may show a true primary pigment degeneration. It is interesting to note that all of my cases, except Case 7 and Case 5 (which was not scrutinized carefully for iris changes because of unawareness at the time of the problem under discussion) showed iris changes of major magnitude, namely iris hypoplasia or atrophy, permitting the deeper iris pigment epithelium to be visualized by direct illumination and without magnification in many instances, and by slitlamp in others.

Case 4 deserves particular attention because of the extreme amount of iris atrophy, with a slitlike hole in the right iris. Upon transillumination, the atrophic areas were dramatically revealed by the punched-out appearance of the retro-illuminated iris. A primary type of degeneration or atrophy was considered but this appears unlikely because the condition was nonprogressive and because of the presence of associated retinal changes, the patient's age, and the probable history of German measles.

All cases, however, presented definite pigment abnormalities of the retina, varying in distribution and characteristics. Of particular interest were the facts that involvement of the posterior pole was a frequent occurrence and that no involvement of the choroid could be found ophthalmoscopically.

From the observations made, it appears that positive points favoring the diagnosis of maternal rubella retinitis in a deaf child would be:

1. A history of German measles or of exposure to German measles, or of mild constitutional symptoms with or without a rash, during the first two or three months of pregnancy.

2. Findings associated with the syndrome, especially low birth weight and congenital anomalies (cataracts, cardiac defects, deafness, mental deficiencies).

3. Ophthalmologic changes, notably:

- a. Hypoplasia or atrophy of the irises, with visualization of the underlying iris pigment epithelium. To be emphasized at this point is the fact that no similar mention of these changes has been described in retinitis pigmentosa, in my experience.

- b. Pigmentary disturbances of the retina. The pigment deposits may vary in form from fine, powdery or sprinkled or granular shapes to those more discrete or corpuscular. The pigment distribution may involve all sectors of the periphery, or be limited to some sectors but, characteristically, is most prominent in the posterior pole. No associated choroidal changes have been demonstrated.

- c. The optic discs are normal or may appear only suggestively pallid.

- d. The retinal vessels are normal in size.

- e. Visual acuity is normal or near normal.

- f. Nonprogression of the lesions appears to be the rule.

Repeated visual field studies have not been made in these cases but such investigations would be of great value. The greatest stumbling block in a study of deaf patients is the difficulty in communication, with its accompanying excessive demand on available time. Many of the children are too young to make a field study valid. However, as the children under observation reach a more responsible age, valid studies and conclusions will be possible.

It is interesting to speculate on the factors

which influence the development of the changes, their severity, and distribution. Several possibilities are obvious. The time of infection, as related to the embryologic stage of development, would predetermine which tissues would be involved by the infectious processes. Immaturity of the developing tissues predisposes to involvement. The virulence of the infecting organism in the mother would be a second important factor which, in turn, would be influenced by the degree of the mother's immunity.

In conclusion, I wish to call attention to the important fact that diseases other than rubella may produce a picture similar to that of maternal rubella retinitis. The case of

Walsh, already cited, of rubeola producing changes similar to those herein described illustrates this point. At this time, however, rubella certainly appears to be the principal etiologic culprit.

CONCLUSIONS

1. Clinical features of retinitis pigmentosa and maternal rubella were presented, with special emphasis on the ophthalmologic aspects.

2. Seven cases in patients with deafness were reported.

3. Features favoring the diagnosis of maternal rubella retinitis were presented.

235 Alexander Street (7).

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NOTES, CASES, INSTRUMENTS

GRANULOMATOUS UVEITIS*

ASSOCIATED WITH DISSEMINATED
COCCIDIOIDOMYCOSIS

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Coccidioides immitis is apparently an uncommon cause of endogenous uveitis. We have previously reported a case of juxtapapillary chorioretinitis, associated with proven pulmonary coccidioidomycosis¹ in which the presumptive evidence for relating the two lesions was overwhelming. This case was compared with two previously reported instances of chorioretinitis, one of which (Levitt⁴) was associated with pulmonary coccidioidomycosis and the other (Lovekin⁵) associated with disseminated coccidioidomycosis. Although the latter patient died, permission for histopathologic examination of the eyes could not be obtained, and in the other two cases, persistence of useful vision in the involved eyes made enucleation unwarranted.

The following discussion represents a case of disseminated coccidioidomycosis with ocular involvement in which pathologic studies were performed.

REPORT OF A CASE

The patient, a 24-year-old Negress, was first seen in February, 1954, with weakness, weight loss, anorexia, and anemia. Subsequent studies by the medical service including agglutinations, cultures, and lymph node and skin biopsies established a

*From the Ophthalmology and Pathology Services, Brooke Army Hospital, Fort Sam Houston, Texas. Presented at the postgraduate course in ophthalmology, Walter Reed Army Hospital, March, 1957.

diagnosis of disseminated coccidioidomycosis with pulmonary, osseous, and cutaneous involvement. The skin of the nose and upper lip showed characteristic lesions. She was treated with a variety of compounds and one of these (fungicide Tetrahydrofluorone), which was on experimental clinical trial, had reportedly caused blindness in laboratory animals. For this reason she was referred to the eye clinic in July, 1954, for routine examination despite absence of ocular symptoms. A thorough evaluation at this time failed to reveal any ocular abnormalities except for myopia correctible to 20/15, J1, in both eyes with appropriate lenses.

She was next seen in the eye clinic in January, 1955, with complaints of redness, pain, and photophobia in the left eye of 24 hours' duration. Visual acuity and tension in both eyes were normal, and external, biomicroscopic, and ophthalmoscopic examinations of the right eye were normal. The bulbar conjunctiva of the left eye was injected but no ciliary flush was present. Numerous mutton-fat precipitates were noted on the corneal endothelium and there was a three-plus flare with abundant non-circulating particles in the anterior chamber. Examination of the retina failed to reveal any patches of exudate; however, heavy vitreous floaters prevented adequate visualization. She was treated with topical atropine and cortisone drops plus warm compresses and gradually improved on this treatment over a period of one month, after which she failed to report as directed.

The patient was next seen in the eye clinic in July, 1955, by which time the iris of the left eye had become bound down with heavy posterior synechias and the previously noted keratic precipitates, flare, cells, and vitreous floaters were again present. The right eye remained normal. Dilatation of the left pupil was only partially successful; however, during the next two months several examiners noted a patch of juxtapapillary chorioretinitis in the left fundus and the vision in this eye gradually deteriorated to 20/200. The patient was followed at periodic intervals in the eye clinic during the next year and no essential changes were noted in her ocular status; however, she continued to show the characteristic findings of a chronic granulomatous uveitis in the left eye. She died October 1, 1956.

DISCUSSION

Postmortem examination revealed metastatic foci of granulomatous infection in the lungs, kidney, liver, spleen, heart, bone marrow, and adrenal and thyroid glands. Both eyes were also removed for histologic examination and serial sections were stained with either Gridley, hematoxylin-eosin, or Schiff (periodic acid) stains. No pathologic

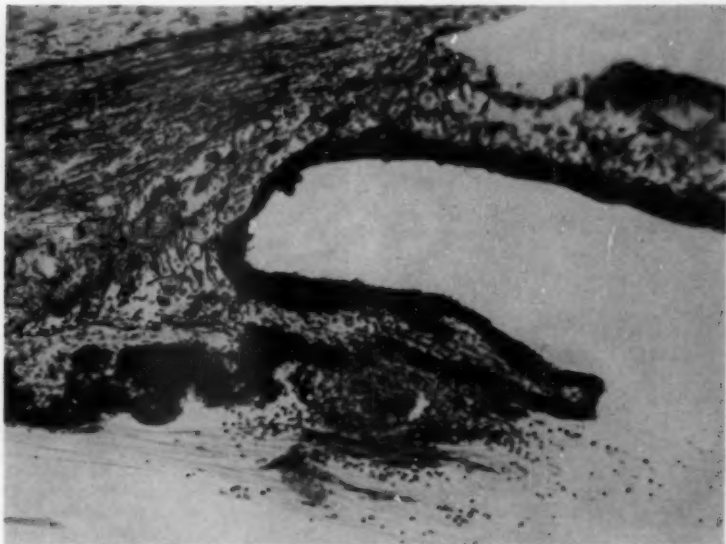


Fig. 1 (Brown, Kellenberger, and Hudson). Section showing granulomatous lesion on ciliary process ($\times 105$, hematoxylin-eosin).

changes could be found in the right eye. Sections of the left eye showed areas of nodular granulomatous inflammation of the ciliary body. Figures 1 and 2 represent various magnifications of the same nodule situated on a ciliary process.

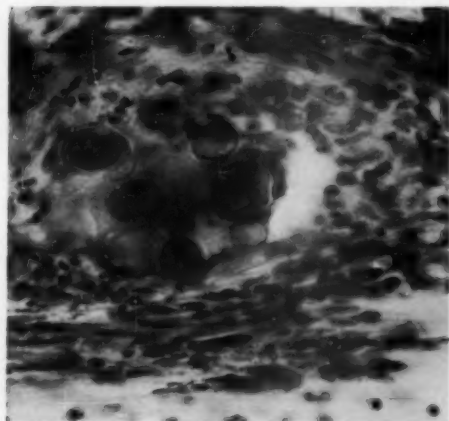
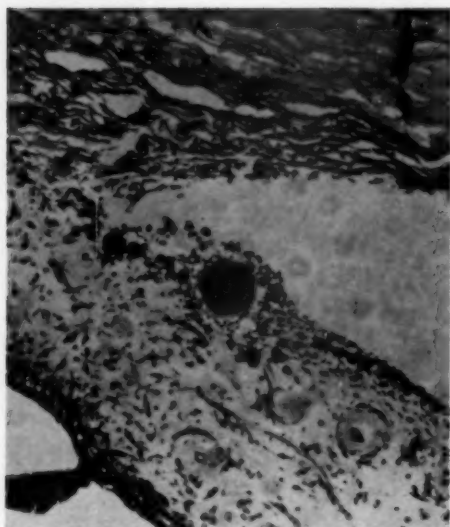


Fig. 2 (Brown, Kellenberger, and Hudson). Higher magnification of Figure 1, showing details of giant cells and spherules ($\times 475$, hematoxylin-eosin).

The higher magnification illustrates details of several giant cells containing spherules with doubly refractile walls enclosing many endospores characteristic of *Coccidioides immitis*. The organisms are surrounded by a heavy infiltrate containing lymphocytes, plasma cells, and epithelioid cells. One region of the iris showed a granulomatous lesion in the stroma near the angle which contained giant cells and spherules (fig. 3).

Serial sections of the juxtapapillary region, where a chorioretinitis had been observed ophthalmoscopically, were carefully examined for the presence of organisms and none were found but a perivascular inflammation consisting primarily of lymphocytes was evident in this area.

Woods⁶ in his recent exhaustive review on endogenous uveitis classifies fungi as rare causes of granulomatous eye disease. Organisms have actually been demonstrated in intraocular tissues where *Blastomyces*, *Aspergillus*, *Actinomyces*, *Mucor*, and *Monilia* were the etiologic agents in human infection (Friedenwald, et al.,⁷ Woods⁶). In addition, *Histoplasma* has been found in the eyes of



experimentally infected laboratory animals (Day²). Our review of the ophthalmic literature, however, fails to reveal a previously reported case of uveitis apparently due to *Coccidioides* and proven by histopathologic examination.

SUMMARY

A case of granulomatous uveitis associated with disseminated coccidioidomycosis is presented and the histopathologic findings are discussed.

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Fig. 3 (Brown, Kellenberger, and Hudson). Section of iris showing giant cell near angle. Adjacent serial sections contained spherules (X105, periodic acid-Schiff).

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CIRCLINE FLUORESCENT TUBE KERATOGRAPH

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As Amsler¹ points out in his discussion of keratography, Placido's target disc of concentric circles is useful in revealing the tectonic nature and geometric curvature of the anterior corneal surface. A photorecord or keratograph of the specular reflections of an illuminated pattern of circles provided the basis for the Zeiss-Amsler Model² of keratoscope camera (now, no longer manufactured). The concentrically arranged triple circline fluorescent tube lighting fixture available commercially lends itself to design

of a simple keratograph (figs. 1, 2 and 3). This type of electrical fixture is manufactured by several concerns and widely distributed.³ I have employed a triple circline fluorescent tube ceiling fixture and a direct focusing, axially mounted camera and standard chinrest⁴ and laboratory supports⁵ to construct a serviceable photokeratograph suitable for general usage.

Insofar as cameras are concerned, any direct-focusing 35 mm. camera with either ground-glass as in early Exaktas, Praktica, of Exa, or with pentaprism direct-viewing oculars as in newer models—Exakta, Prakticon, Hexacon, Praktina, or Retina Reflex—may be used.⁶

The settings will vary with the model of camera utilized. To obtain the magnification

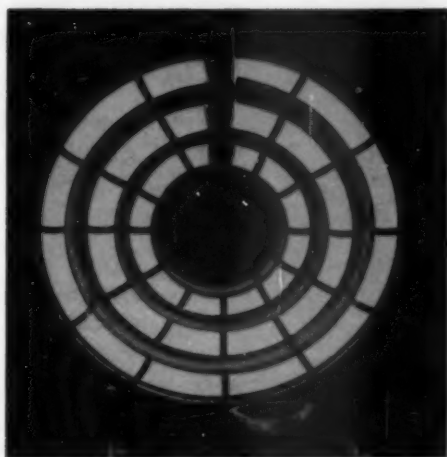


Fig. 1 (Stein). Appearance of illuminated triple circline target. Angle markers with one-fourth inch Scotch electrical tape (black).

and short working distance required for a large image of the cornea in the 35-mm. frame one of the following three set-ups is feasible: (1) The regular 58-mm. f3.5 lens with a 12-cm. extension tube; (2) an 80-mm. f2.8 telephoto lens with a 6.0 or 12 cm. extension tube; (3) an f2.8, 58-mm. Biotar with an added plus 13.5 diopter achromat (Keeler⁷) in a series VI⁸ Tiffen adapting ring



Fig. 2 (Stein). Circline keratograph in use, showing integral chinrest. (Assemblage of Fisher Flexa-frame connectors and rods.)

and with one-cm. extension ring. When one desires to include both eyes in the film frame, the 58-mm. lens with a one- or three-cm. extension tube is employed. Tri-X Pan film of the Eastman Kodak Company permits very short exposures with narrow diaphragmatic openings for maximum depth of focus and clarity. For color shots the Eastman Ektachrome film yields good pictures with rapid exposures.

Mydriasis is helpful in providing the black background of the dilated pupil. Profile views of the corneal apex obtainable by abduction or adduction of the eye depict the conic or deformed cornea very conspicuously. It is helpful to ask the patient to fixate upon one of the Scotch black electrical tape markers on the circline (fig. 1) so that a particular feature (facette, conus, bulla, or ulcer) would be intersected by a reflection of one of the circlines; otherwise it may fall between the concentric reflections. Photos should be made in a darkened room to avoid corneal reflections.

Inasmuch as the planar target of 16-inch diameter (40.64 cm.) is specularly reflected by a hemispheric cornea of about 1.6-cm. diameter (approximate ratio of 1:25), it is

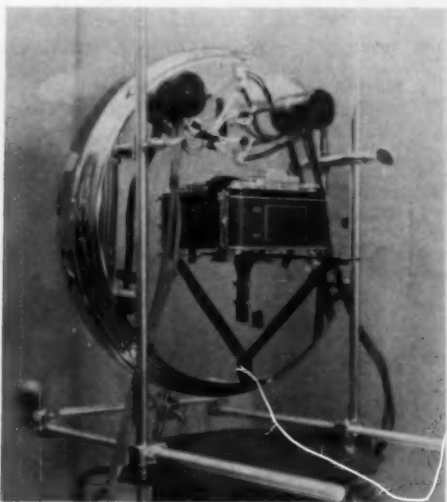


Fig. 3 (Stein). Oblique rear view of photokeratograph.

apparent that the laws of optical imagery of a convex mirror govern the size relationships of the reflections of the three concentric circles. Regarding the target as a tangent plane one finds that the inner circle is wider (and truer) and the outer circle narrower and closer to the middle circle. In view of this a better Placido target arrangement for photokeratography would be a hemispheric bowl but this entails greater construction difficulties and more expense, as would use of fluorescent sign tubing or flash-tube circles. However, concentricity is unaffected and distortions manifest irrespective of the target planarity.

In keratoconus, cornea plana, or ectasia, faceting, ulcerative or bullous keratitis, high-degree astigmatism, and embedded foreign bodies, the deformation of the specular reflections of the luminous Placido target is definitive and diagnostic. With regard to keratoplasty especially, Amsler (in Rycroft, p. 194¹) says "there is really only the Placido disc to reveal the initial state and successive phases of the adjustment of the graft to the form of the cornea," and also the degree of geometric success of the keratoplasty.

This equipment is useful in ocular research, office and clinic practice, and compensation or insurance records. For Selective Service usage the photokeratograph of congenital or posttraumatic deformation may provide opportunity for central screening of the photos rather than shipment of the selectee for diagnosis at a distant hospital center or eye clinic. Similarly, the evaluation of service personnel can be done at a few centers while the man maintains duty status until decision for further diagnosis or hospitalization is arrived at. For postoperative studies of cataract incision healing the keratograph is quite illuminating. One sees the draglines of corneal deformation caused by malplaced or taut sutures and can well appreciate the irregular corneal astigmatism that prevents good final vision.

203 Sinclair Building.

ACKNOWLEDGMENT

The Medical Maintenance Shop personnel at the Walter Reed Army Hospital, Washington, D.C., aided the mechanical construction and made valuable practical suggestions for simplification. Col. W. L. Spaulding (of the Eye Service) and Col. Austin Lowrey, Jr. (of the Ocular Research Unit) encouraged completion of the project.

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4. Chinrest, portable table-clamp model from Barnet Optical Lab., 3120 N. Cicero Ave., Chicago 41, Ill.
5. Jackson Laboratory Stands, etc. from Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.
6. Cameras and accessories available from: Seymour's Inc., 350 W. 31st St., New York 1, N.Y.; Barnett Labs, 3120 N. Cicero Ave., Chicago 41, Ill.
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LARGE ABERRANT MACULAR VESSELS*

EDWARD TAMLER, M.D.
San Francisco, California

Rare mention has been made in the literature of large aberrant vessels crossing the macula.¹⁻⁶ In all cases reported, the anoma-

lous artery or vein was derived from the main inferior temporal trunks.

In Kornzweig's⁵ and Volk's⁶ cases, the visual acuity was correctible to 20/20 in the affected eye. Volk concluded that some un-

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Fig. 1 (Tamler). Fundus of the right eye, showing large aberrant macular vessels.



Fig. 2 (Tamler). Left fundus, showing normal vascular pattern.

known metabolic factors normally excluded developing large vessels from the macula but that the absence of large vessels in the macula was not a prerequisite for normal differentiation of the macula. In the case reported here, the presence of a large vessel in the macula was associated with decreased visual acuity and was the only positive finding noted that could account for the diminished acuity.

REPORT OF CASE

A 13-year-old boy was brought in by his father with the story that the youngster had had poor vision in his right eye for many years. Several years before an eye test in school revealed a lowered acuity with the right eye. He was referred to a doctor who gave him glasses. The child discarded the glasses soon because "they didn't help me." At the present time he had no visual complaints but was referred because a school test again brought out the fact that his vision was defective. There was no history of strabismus.

The eye examination was not remarkable, except for the lowered visual acuity, right eye, and the associated fundus picture. Manifest refraction gave: R.E., +0.25D. sph., 20/50; L.E., +1.0D. sph., 20/25+. Cycloplegic refraction resulted in: R.E., +1.75D. sph. \ominus +0.5D. cyl. ax. 95°, 20/50; L.E., +2.25D. sph. \ominus +0.25D. cyl. ax. 90°, 20/25+.

Fundus examination of the right eye presented an interesting picture (fig. 1). The main arteries subdivided early so that an increased number of vessels appeared to cross the disc margin. There was a tortuous cilioretinal artery. The superior venous distribution was not remarkable. Inferiorly the main trunk divided into the two large inferior

veins on the disc. One ran downward toward the 6-o'clock position, branching as it proceeded toward the periphery. What was obviously the inferior temporal vein was located quite high and coursed directly through the macula, with one branch going just above the fovea and one just below. The left fundus presented a normal vascular distribution pattern (fig. 2).

Attempts to have the child return for visual function studies, including entopic imagery were unsuccessful.

COMMENTS

The visual acuity in the right eye of this patient could not be improved beyond 20/50. The only finding to explain this poor vision was the aberrant inferior temporal vein crossing the macula. This would indicate that, although, according to Volk, the presence of large macular vessels need not inhibit the normal differentiation of the macula, they may indeed affect macular function, as in this patient.

It is interesting to note that in cases reported in the literature and in this case it was the inferior temporal vessels or their branches that were found in the anomalous position. This is probably related to the embryologic location and changes in the fetal fissure and to the fact that the lower retina is more prone to congenital deformities.

Stanford University Hospitals (15).

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GLAUCOMA INDUCED BY SYSTEMIC STEROID THERAPY

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Steroid therapy, both topical and systemic, has been well established as a serviceable addition to our medical therapeutics. As is true with most powerful medications, definite contraindications have been given adequate publicity.

So far as ophthalmic problems are concerned these warnings have consisted chiefly of caution in the use of topical cortisone in the treatment of corneal ulcer. Most practitioners are well informed of the danger of enhancing a dendritic ulcer with the prolonged use of cortisone preparations. In many cases its use has led to perforation of the cornea.

The ophthalmologist has also been made aware of the danger in systemic administration of steroids as treatment for posterior uveitis when tuberculosis is an etiologic possibility. However, neither the general practitioner nor the ophthalmologist seems to be cognizant of the danger of inducing acute glaucoma or chronic glaucoma in patients receiving systemic steroid therapy over long periods of time, particularly in the treatment of rheumatoid arthritis.

This danger was called to my attention by three cases seen in private practice during the past six months. The underlying physiologic basis for this correlation will require extensive studies, and an attempt to determine the basis for this clinical association

has been initiated at the Boston City Hospital. At the present time the most likely factor would seem to be the tendency for retention of fluid, which affects all tissues not excepting the eye. Whether the factors concerned are an edema of ocular tissues directly related to the production of aqueous or to its elimination will require further study. In the meantime it is felt that the possibility of inducing or aggravating the existing glaucoma should be called to the attention of all physicians using systemic steroid therapy.

CASE REPORTS

CASE 1

E. H., a 58-year-old white man, had had visual examinations for the past 10 years, with normal vision of 20/20 in each eye and normal intraocular pressure which had been taken routinely on four occasions. It was noticed in March, 1956, that the patient seemed to have gained weight. The history was then elicited that he had been taking ACTH for arthritis for the past year. At that time the amount of steroid therapy had been reduced but he was still using 5.0 mg. of Meticorten three times a day.

Visual acuity was 20/20 in each eye and intraocular pressure was 35 mm. Hg, O.D., and 27 mm. Hg (Schiotz), O.S. The angle between the iris and cornea was of normal depth and gonioscopic examination showed the angle to be open although moderately narrow. There was questionable cupping of the right optic disc in the 12-o'clock meridian. Visual fields were normal to two and five-mm. white test objects. On two-percent pilocarpine hydrochloride four times a day the intraocular pressure fell to: 19 mm. Hg, O.D.; 17 mm. Hg, O.S. Since April, 1956, the intraocular pressure has never gone above 25 mm. Hg in the right eye or 22 mm. Hg in the left. The patient is still using the steroid therapy for arthritis and the pilocarpine to control his intraocular pressure.

CASE 2

E. B., a 59-year-old white woman. Her past history revealed that her mother had had glaucoma. She was first seen because of the complaint "burning eyes," at which time the Schiøtz tonometer showed the pressure to be 32 to 35 mm. Hg in each eye, with normal visual fields. Ophthalmologic examination showed no evidence of optic atrophy or cupping. She returned for gonioscopic examination, which showed an open angle, and a water-drinking test, which was not significant in that it did not cause a significant rise in the intraocular pressure. Over a period of six months her pressure never was reduced below 35 mm. Hg (Schiøtz) until 0.5-percent pilocarpine was prescribed for use three times a day. It was not until after her fifth visit that it was learned that she was taking 5.0 mg. of Meticcorten each day as treatment for arthritis. During previous examinations no mention of her arthritis or medication was elicited. At the present time, under 0.5-percent pilocarpine, her intraocular pressure is controlled at 24 mm. Hg. Visual fields are normal and there is no evidence of optic atrophy.

CASE 3

A. S., a 65-year-old white woman, had had a complete ophthalmic examination in 1949, including tonometry, and showed no evidence of eye disease except for slight arteriosclerotic changes in the retinal vessels. At that time she was on a low salt and low fluid diet as treatment for hypertension. Six years later she consulted me because of sudden headache and loss of vision in the right eye.

The patient was in acute distress, with pain over the right eye, nausea but no vomiting. The cornea of the right eye was edematous and steamy. The chamber did not appear shallow. Gonioscopy could not be performed because of the corneal haze, even with the use of glycerine in an attempt to clear the cornea. The intraocular pressure was 65 mm. Hg, O.D.; 22 mm. Hg, (Schiøtz), O.S. The right pupil was moderately dilated. It was impossible to see the retina adequately because of the corneal edema.

With the use of a mixture of mecholyl, prostigmine, and pilocarpine every 10 minutes, the intraocular pressure was reduced within two hours. Vision returned and the patient was free of symptoms. Sometime later gonioscopy was performed and showed a very narrow angle without peripheral anterior synechias.

When the patient returned for an ophthalmologic work-up, she volunteered the information that she had been taking cortisone for arthritis for several years and was continuing to do so at the present time. Under two-percent pilocarpine four times a day, the intraocular pressure has remained below 19 mm. Hg in each eye, with a significant loss of visual field of approximately 10 to 20 degrees in the form of a Rönne nasal step in the right eye.

DISCUSSION

It would certainly be desirable to check the intraocular pressure and to do tonographic studies on a large series of patients undergoing systemic steroid therapy, particularly when the treatment is prolonged. Such data could then be used to analyze the relationship of the therapy to the elevation of the intraocular pressure.

Is the pathogenesis one of increased aqueous production, decreased outflow, or water retention? If the latter, how does cortisone affect the osmotic relationships between blood-plasma and aqueous?

Not only would such a study prove or disprove the clinical correlation between glaucoma and steroid therapy but might give us fundamental information regarding the formation and exit of aqueous from ciliary body into the venous channels associated with the canal of Schlemm.

The cases herein reported certainly raise more questions than they supply answers. At the present time we are seeking to confirm these data at the Massachusetts Memorial and Boston City Hospitals. Meanwhile the clinician can be of aid in compiling similar cases and the general practitioner can be put on his guard as to this "complication" of cortisone therapy.

SUMMARY

Three cases have been reported in which it appears that systemic use of cortisone preparations plays an etiologic role in the development of acute and chronic glaucoma. This impression is an empirical one and will require basic physiologic studies by adequately equipped laboratories to give scientific validity to this association. While such studies are being performed, either to confirm or deny such association, it is felt that the practitioner should keep in mind the possibility of glaucoma in chronic cases receiving steroid therapy.

358 Commonwealth Avenue.

BOURNEVILLE'S SYNDROME* (TUBEROUS SCLEROSIS)

A CASE REPORT

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AND

M. C. MAUDGAL, M.B.
Amritsar, India

Bourneville's syndrome is a rare disease of the neuroectodermal tissues, in which skin lesions in the form of sebaceous adenomas, mulberrylike tumors of the retina, and nervous system involvement leading to epileptic fits, mental deterioration, and idiocy may be important signs. Ross and Dickerson (1943) reported an incidence of one in 500,000 in the American population. Dawson (1954) gave a figure of one in 300,000 for London. In Amritsar, this is the first case seen during a clinical experience of 10 years and, in the records of this hospital, no case of this disease was diagnosed and reported for the last 30 years. To our knowledge, no report of this disease has come from the Indian sub-continent.

CASE REPORT

Manjit Singh, an 11-year-old boy, was first seen in 1954, with the following symptoms: He had been fidgety, irritable, and of unstable temperament since his infancy. He cried, screamed, or laughed without reason and kept muttering. He moved his hands and feet aimlessly and picked at articles within reach.

Family history. Both parents were normal. He was the second child in the family. His older brother, aged 15 years, was normal in all respects. Two younger sisters and one brother were normal. He was born at full-term; pregnancy and delivery were uneventful. There was nothing worth mentioning in the postnatal history. His body development and other milestones in his growth, such as head holding, weaning, sitting, cutting teeth, walking, had all been normal. He was in the second standard at school and was progressing normally in his studies.

Physical signs. He was a moderately built and moderately well-nourished boy who showed a splatter of raised, dark-brown, pigmented nodules over the forehead, nose, cheeks, neck, shoulders, and



Fig. 1 (Nirankari and Maudgal). Appearance of child at first examination.

chest (figs. 1 and 2). The nodules were discrete, varying in size from two to eight mm. and raised about one to three mm. above the surface. There were no similar lesions on the rest of the body. The mucous membranes of the mouth and cheek were free from any growth.

Neurologic examination revealed no abnormal finding except the mental changes already described.



Fig. 2 (Nirankari and Maudgal). Note raised, dark-brown, pigmented nodules.

* From the Department of Ophthalmology, Medical College of Amritsar.

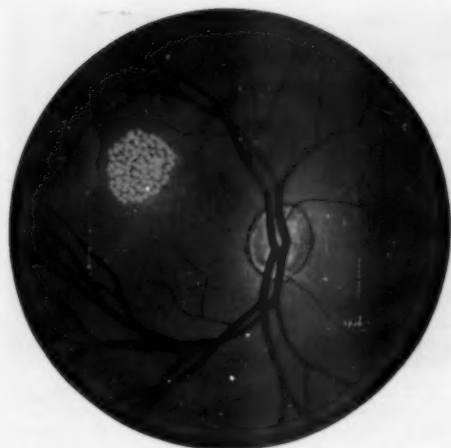


Fig. 3 (Nirankari and Maudgal). Fundus of the right eye.

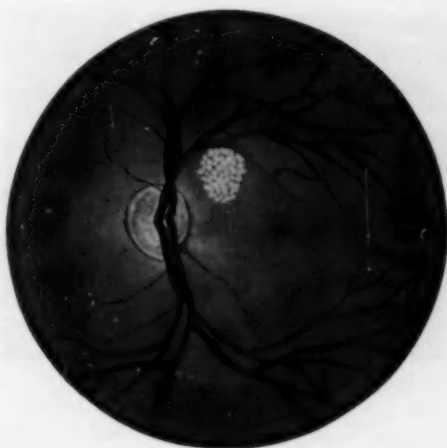


Fig. 4 (Nirankari and Maudgal). Fundus of the left eye.

Ocular signs. There was no squint. Visual acuity was: R.E., 6/9, J1, with slight hypermetropia correctible to normal with +0.75D. sph.; L.E., 6/6, J1. Perimetry revealed a full field; scotometry could not be carried out because of lack of co-operation from the patient.

Fundus examination. The fundus showed a typical picture of Bourneville disease. On the right side, one and one-half disc diameters above the macula, there was a mulberrylike tumor, with cystic nodules on its surface, dull-white in color, oval in shape, about one and one-half times the size of the disc. It was raised about two diopters above the surface. The surrounding retina was normal. No vessels were seen on its surface. The rest of fundus

picture was normal (fig. 3). The tumor in the left eye was of a similar appearance, situated about one disc diameter to the upper and outer side of the disc along a main branch of the superior temporal artery. It was also avascular (fig. 4). The two tumors appeared to be lying on corresponding retinal meridians.

This case has now been observed for a period of two years. The clinical condition has been stationary, there being no change in any of the lesions, skin, retinal and so forth. The child has maintained a steady progress at school. The parents have refused to have a skin nodule removed for biopsy.

Department of Ophthalmology.

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BEDSIDE REMOVAL OF CORNEAL SUTURES*

JOHN T. SIMONTON, M.D.

AND

J. ELLIOTT BLAYDES, JR., M.D.

Rye, New York

At times the removal of corneal or corneoscleral sutures can be trying to the operator and the patient.

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The following aid is presented:

The head of the patient's bed is gatched to about 40 degrees. Figure 1 shows the patient in the gatched-up position, and the operator is demonstrating approximately the position that the forearms and wrists will be in while removing sutures from the eye. It is noted that there is no support to help steady the operator's forearms and wrists.

Figure 2 shows the patient with a standard hospital bed pillow on each side of his head. In this figure it is noted that the forearms



Fig. 1 (Simonton and Blaydes). The patient in position.

and wrists are being supported by the pillows.

Figure 3 shows the actual process of removing a corneoscleral suture from the left eye. Following the instillation of topical anesthesia, the assistant gently holds the upper lid with a Desmarres lid retractor. The operator then removes the suture, with complete ease, due to the support of the forearms and wrists afforded by the pillows alongside the patient's head. In this technique, the scissors always come from below up or from either side, but never from above down. This precaution avoids possible injury in the event of an involuntary squeeze.

The tip of the scissors is inserted under the knot and the suture is cut. Then the



Fig. 2 (Simonton and Blaydes). Surgeon's forearms and wrists are on pillows.



Fig. 3 (Simonton and Blaydes). Removal of corneoscleral suture from the left eye.

suture is picked up by the forceps and removed from its tract. The suture is not held by the forceps while the scissors are making the cut.

SUMMARY

A readily available aid, at no additional expense, is presented for the removal of corneal or corneoscleral sutures.

Blind Brook Lodge.

MODIFIED TREPINE DESIGN*

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Winston-Salem, North Carolina

The design of trephines for use by ophthalmic surgeons has until now been based almost solely on their sharpness. An extensive bibliography indicates that all circular trephines for use in corneal transplants had cutting edges which were ground from the outside. This is natural because manufacturers of surgical and optical apparatus endeavor to keep down their costs by grinding the outside surface of the steel tube to be sharpened. This good industrial practice

*From the Marguerite Barr Moon Eye Research Foundation, Inc. This study was aided by a grant from the National Institutes of Health, Bethesda, Maryland, under contract No. B-1243.

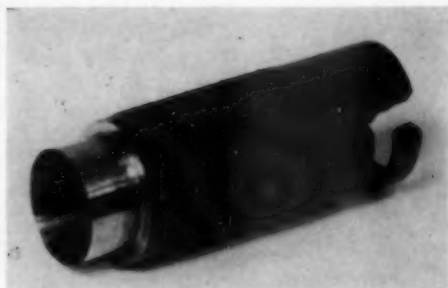


Fig. 1 (Moon and Holt). The Moon inside-grind trephine.

produces a trephine which gives "oval" results and is completely irrelevant to the needs of surgeons who require that a trephine always cut a true "disc."

The cornea, made of resilient materials, has five layers, each with different textures and thicknesses. It, therefore, presents a problem in conflicting forces which set up "tensions" that both radiate out from the center to the periphery and also from the circumference at Schlemm's canal inward—not always toward the center but sometimes horizontally or vertically to various nodal points. When the surgeon applies the trephine in a "free" manner, these strong forces tend to overcome the control which he tries to exert; the result is that the vector sum

of these component forces diverts the trephine from its desired stationary position and moves it in one direction or another, in spite of all that the surgeon can do.

The Moon trephine designed by T. Elmer Moon 11 years ago (after he lost his own sight), incorporates the features needed to cut round discs so precisely that each one is exactly alike, and to do this safely. The trephine which Moon designed has its cutting edge sharpened by what is termed an "inside grind." This trephine cuts a perfect, uniform, standard-sized circular disc. For safety, a "step" or "shoulder" was incorporated so designed as to limit penetration of the trephine through corneal tissue (and slightly into the aqueous chamber) while preventing injury to the posterior portions of the eye.

The Moon trephine is made of steel with a much thicker wall and higher carbon content, therefore making it harder. It is possible to "temper" the Moon trephine "cool." The use of very fine grits has made it possible to (a) put a finer cutting edge on the trephine and (b) prevent the temper from being removed during grinding. The result is a trephine with perfected cutting properties as well as a feature which precisely controls the operation.

209 Reynolds Building (3)

OPHTHALMIC MINIATURE

There is also something in the gentle sparkle of the eye. The sparkle in the eyes of beauty, the glance of joy, of enthusiasm, of rapture, is not so poetical as it seems, inasmuch as it is no more than intensified secretion of tears. The latter gets its increase through nervous excitation, so that the guilty sparkle should also be of the same nature. This may be considered as in some degree a flow of tears in its first stages.

Hans Gross, *Criminal Psychology*, Little, Brown and Co., 1915.

OPHTHALMIC RESEARCH

EDITED BY FRANK W. NEWELL, M.D.

Abstracts of papers presented before the Western Section of the Association for Research in Ophthalmology, University of California Medical Center, San Francisco, November 14 and 15, 1957.

LEVON K. GARRON, M.D., *Program Chairman*

A. RAY IRVINE, M.D., *Section Secretary*

The retinal circulation time. Peter Chao, M.D., and Milton Flocks, M.D., Stanford University School of Medicine, San Francisco.

Adler states that knowledge of the circulation time of the retina would be invaluable. We have devised a technique whereby the circulation time of the cat retina can be measured. One-percent aqueous trypan blue is injected rapidly into one common carotid artery of an anesthetized cat with pupils dilated by mydriatic drugs. At the same time, a second person, with stop watch in hand is carefully focussing with an ophthalmoscope on a branch of the central retinal artery and a branch of the central retinal vein as they cross the disc of the eye on the same side as the injected artery. At the moment the artery turns deep blue at the disc margin the stop watch is started. From 1.9 to 2.1 seconds later the vein at the disc margin also becomes deep blue and the watch is stopped. The trypan is seen to take approximately two seconds to transverse the capillary bed of the retina and return to the disc margin. More than 100 trials have been made on 15 cats.

Increasing the intraocular pressure by compression of the sclera slows the circulation time, and lowering the intraocular pressure by paracentesis apparently makes the circulation time faster.

Retinal and choroidal blood supply at the macula. Michael J. Hogan, M. D., Ben Goldfeller, and Winifred Slauson, Francis I. Proctor Foundation for Research

in Ophthalmology, University of California Medical Center, San Francisco.

Eye-bank eyes are used in this study. The macular area (choroid, retina, and sclera) is removed by a 10-mm. circular trephine. A corresponding area is removed on the nasal side, and at the equator for comparative studies.

Two procedures are:

1. These buttons are allowed to undergo autodigestion in saline at 37°C. for two to three days. The retina is then removed, brushed to clear away the cells and pigment, mounted on a slide, and stained either with periodic acid-Schiff or a hematoxylin-van Gieson's stain. The choroid is removed, brushed to remove retinal and suprachoroidal pigment, bleached in permanganate, mounted on a slide, and stained as with retina.

2. Those eyes which are very fresh are fixed in formalin 48 hours, washed 24 hours, and trephined. The entire button is embedded in paraffin, sectioned thinly, bleached and stained as in (1).

Results:

1. *Digested retinal and choroidal tissue.* Retina so prepared and stained with hematoxylin-van Gieson shows the arteriolar and capillary nets more clearly than that stained with PAS. The adventitial and medial cells are clearly visible, but the endothelium is difficult to examine. The pattern of the vessels and their branchings is very easily made out, and pathologic narrowings easily detected.

The choroidal vascular anatomy is much more difficult to study by this method, especially the choriocapillaris, which is obscured by the larger vessels.

2. *Fresh fixed tissue.* It is difficult to obtain perfectly flat sections of the choroid and retina by this method. The use of weights and ice during embedding failed to overcome this difficulty. Serial sectioning, however, enables one to study the anatomy reasonably well.

Perfusion of eyes in a closed system.

W. K. McEwen, Ph.D., Levon K. Garron, M.D., and M. Lynette Feeney, A.B., Francis I. Proctor Foundation for Research in Ophthalmology, University of California Medical Center, San Francisco. (Supported in part by the Council for Research in Glaucoma and Allied Diseases.)

For some time we have been perfusing human eyes with graded latex microspheres in an attempt to estimate the sizes of the exit channels from the anterior chamber. This work indicated that the sizes of the openings were between one and five microns and it was felt that a more precisely controlled technique was necessary for a more accurate estimate of the permeability.

A perfusion chamber was constructed which allows the measurement of the rate of infusate and exfusate at constant pressure, records the pressure in the vitreous during perfusion, and provides for a means of obtaining samples periodically. Prior to the use of latex microspheres, the effects of various variables such as the nature of the solutions, perfusion pressures, drugs, and so forth are being studied. It is hoped determination of some of the factors governing the rate of perfusion will help to clarify the mechanism of the outflow of aqueous.

Electron microscopic study of the angle of the human eye. Levon K. Garron,

M.D., M. Lynette Feeney, A.B., and M. J. Hogan, M.D., Francis I. Proctor Foundation for Research in Ophthalmology, University of California Medical Center, San Francisco.

Tissues of the anterior chamber angle of human eyes with normal anterior chambers have been used in this study to familiarize us with the normal anatomic picture at magnifications of from 10 to 25 thousand times. The eyes were fixed in osmic acid from five to 45 minutes after enucleation or death. Careful dissections were made with the aid of the dissecting microscope. Specimens, 1.0 mm.,³ of pure cornea, sclera, trabeculas, and iris, and areas including Schlemm's canal and ciliary body were obtained for ultrathin sectioning.

A preliminary report was made on the appearance and arrangement of the cells, fibrous elements, nerves, pigment granules, and on the composition and spatial relationships of the trabecular bands.

Recovery of toxoplasma from a human eye. Michael J. Hogan, M.D., P. A. Zweigart, and Ann Lewis, Francis I. Proctor Foundation for Research in Ophthalmology, University of California Medical Center, San Francisco.

The isolation of *Toxoplasma* from the enucleated eye of a 20-year-old man eight years after the initial diagnosis of congenital toxoplasmosis is reported.

The strain isolated was of low virulence for laboratory animals. Experimentally, the strain causes illness in mice but they recover. Inoculated guinea pigs show no signs of illness but develop high dye test titers. Rabbits do not become ill upon inoculation, and may or may not develop a dye test titer.

Ocular effect of high intensity gamma irradiation. Frank Counsel Winter, M.D., Stanford University Medical School, San Francisco.

Pathologic examination of a human eye that had received 13,000 X-rays in the course of treatment for carcinoma of the orbit suggested that there might be a difference in radiosensitivity of the retinal and choroidal vessels. This paper reports the results of a pilot experiment designed to test the effects of high dosage of gamma radiation on the cat's eye. The eyes of three cats were exposed to X rays varying in amounts from 10,000 to 60,000 r. A functional difference in response in uveal and retinal vessels occurred. There was dilatation of uveal vessels as evidenced by engorgement of the veins of the iris and ciliary body. The threshold for this effect was approximately 800 r. Constriction of the retinal vessels occurred first in the arteries and later in the veins. The threshold for this effect occurs between 5,000 and 10,000 r. Dilatation of uveal vessels occurred within 24 hours of a single dose and passed off in seven to 15 days. Constriction of retinal vessels occurred three to five days after a single greater than threshold dose and passed off in 30 to 60 days. Both the uveal and retinal tissues showed edema and diffuse hemorrhage. No structural alterations in the vessels could be demonstrated histologically.

As an incidental finding, marked degeneration change in the ciliary epithelium was noted on histologic preparations. This consisted of swelling and disintegration of the pigmented ciliary epithelium and flattening and disorganization of the nonpigmented epithelium with nuclear and cellular pleomorphism. At doses in the range of 10,000 r, edema of the ciliary epithelium occurred, with the formation of fluid-filled blisters between the pigmented and nonpigmented ciliary epithelium. Disorganization and destruction of the cells occurred at doses of 20,000 r and higher. Other tissue alterations were noted that have already been adequately described in the literature. These included

degeneration of the corneal epithelium, edema of the corneal stroma, degeneration of lens epithelium, cortical cataract, edema and diffuse hemorrhage of iris and ciliary body, hemorrhagic and exudative retinal detachment, and marked degeneration of the rod and cone layers of the retina.

Lacrimal proteins in correlation with the Schirmer test. Olive Fedde Erickson, M.D., Margaret Berg, R.N., and Rachel Hatlen, Stanford University School of Medicine, San Francisco, California.

New developments in paper electrophoresis during 1957 have had a profound effect on improved separations of lacrimal proteins. Problems and achievements can be divided into five categories:

1. Power supply. One of the major concerns has been a constant current. Years of research have gone into the development of the present dependable constant power supplies which can now be set for either constant voltage or amperage for two cells.

2. Electrophoresis strip paper. A great deal of effort has been expended to develop pure and regular paper for this process. This year Beckman Instrument Company changed their paper from a heavy #300-028 to a fine #300-846. This new development made such a great change in the patterns that all runs before June are antiquated, and the six-month-old analytrol had to be converted to accommodate this new paper.

3. Buffer. A phosphate buffer has been used at pH 7.0 for the past four years; however, all of the elements in the six migration zones can be shown with several buffers. The barbital buffer used for blood serum has proved to work nicely with the finer electrophoresis paper currently being used. It has the added advantage that a laboratory equipped to do blood serum studies, which are usually

run at night, can do the lacrimal six-hour runs during the day.

4. Dye. New salts of bromphenol blue which are soluble in methanol have made it possible to obtain good dyes in a half hour. Concentrations of the proteins present can be expressed in terms of bromphenol blue equivalents of lysozyme, using the water-soluble or methanol-soluble dye.

5. Schirmer specimens as the source of lacrimal proteins. The Schirmer test which provides a rough guide to the presence of hyper- or hyposecretion of the lacrimal gland has been the source of the specimens. A 5.0 by 25 mm. pH indicator paper has been used for the test. Any portion not moistened in five minutes is torn or cut off before being securely wrapped in Saran. In those papers moistened in less than five minutes, the time required is recorded. Six lambda (0.006 cc.) is absorbed by each mm. and, because there is such a wide spread, the rate of flow is calculated per minute rather than for five minutes. A 2.5 lambda per minute rate corresponds to the accepted 15 mm. Schirmer border of normal.

Tear proteins divide into six zones; lysozyme, which migrates toward the cathode, and four proteins with the same mobility rate as gamma, beta, and alpha 2 albumin of blood serum, and a sixth zone beyond albumin. Three of these lysozymes, tear beta, and tear albumin reflect the productive power of the lacrimal gland. There is a close correlation between adequate tear proteins and a normal rate.

Normal tears contain lysozyme, globulins, and albumins in approximately a 30 : 40 : 30 relationship. In one arthritic group 82 percent of those with deficient Schirmer tests had 0 to 19 percent lysozyme. In this and in other groups, the same trend was shown in the tear beta and tear albumin. Even medical stu-

dents with normal rates showed a diminishing flow after atropine or scopolamine and produced tears with diminution or absence of tear albumin and lysozyme.

This year has been an eventful one in electrophoresis techniques, so that the exact percentages obtained the first half cannot be compared to those of the latter half of the year.

Tissue culture studies on retinoblastoma.

William van Herick, M.D., Michael J. Hogan, M.D., and A. Benedek, B.S., Francis I. Proctor Foundation for Research in Ophthalmology, University of California Medical Center, San Francisco.

Fresh retinoblastoma tumor specimens were obtained from enucleated eyes. Attempts were made to propagate these by tissue culture methods. The objectives were as follows: (1) to evaluate growth possibilities, (2) to study cell morphology and growth characteristics, and (3) with established cultures evaluate the effects of biologic agents.

The methods used were those of well-established culture procedures, using Maxmow slides and flasks, Porter flasks, Rose chambers, and thin-walled test tubes. Varying proportions of embryo extract, 199 solution, basic salt solution, and human cord serum as liquid nutrients were used.

Five enucleated eyes were received and explanted. Definite growth resulted from two specimens. The other three specimens showed some growth but mainly tissue survival. Microscopic photographs were obtained from fresh and stained specimens. Several of our most promising cultures had to be discontinued, due to sudden and overwhelming contamination by mold. Thus it was not possible to evaluate how long these cultures could have been continued.

Projection slides show interesting cell

morphology, having very little resemblance to original cell morphology. Some cells are of extremely large size.

The use of heparin in macular edemas.

Sol Rome, M.D., University of Southern California, Los Angeles.

A frequent effect noted in the treatment of senile macular degenerations with heparin was the diminution and disappearance of the associated edema. The full extent of the pathologic alteration frequently became ophthalmoscopically visible only after this treatment caused absorption of the edema. Because of this, an attempt was made to evaluate the effect of heparin on various, noninflammatory edematous processes involving the macular area, some of which were not necessarily associated with senile macular degeneration.

This report summarizes the results of treatment in 17 cases of macular edema, subdivided clinically into six cases of aphakic macular edema, one case of macular edema in a postoperative retinal detachment, four cases of incomplete macular holes, three cases of subacute disciform macular degeneration, and two cases of central angiospastic retinopathy.

The dosage schedule used was 100 mg. (0.5 cc.) of the sodium salt of concentrated 200 mg./cc. aqueous heparin intravenously twice weekly for a series of 10 to 20 injections, followed by a three-week rest interval.

Four of six cases of aphakic macular edema were markedly improved, one moderately improved, and one stationary. One case of macular edema in the only eye of a postoperative retinal detachment case showed marked improvement. Two cases with incomplete macular holes showed marked improvement, one showed moderate improvement. Two cases of early subacute disciform macular edema showed marked improvement, one moderate improvement. Two cases of central serous

retinopathy were markedly improved. In the last decade other important actions of heparin in addition to its anticoagulant action have been well documented. A recent review of the literature with an extensive bibliography is presented by Simon. The lipemia-clearing action of heparin and its action on serum lipoproteins are now well known and are under extensive investigation. Another important property is its inhibitory effect on hyaluronidase, the enzyme causing increased capillary permeability. In many exudative processes and in atherosclerosis, there is an increase in serum hyaluronidase. An interesting sidelight is that the beneficial effect of salicylates is also traced to this inhibition of hyaluronidase. The relation of heparin to the steroids, ACTH, cortisone, and so forth, are of importance. Although heparin and the steroids are natural antagonists in most reactions, they both inhibit hyaluronidase. It is conjectured that the edema-clearing effect of heparin may be partly due to this hyaluronidase-inhibiting property. It is suggested that heparin be used in resistant cases of macular edema.

Motion picture recording of eye movements. Jane E. Hyde, Ph.D., Robert G. Eason, Ph.D., and Muriel Stevenson, D.B.O., University of California Medical Center, Los Angeles. This work was aided by a grant (B-1000) of the United States Public Health Service.

Motion pictures of two young patients with nystagmus have been obtained which illustrate possible applications of the method of single frame analysis (Hyde and Eason, in preparation) to both clinical diagnosis and teaching. From such analysis one can obtain information as to the direction, extent, and relative velocity of eye movements in any plane; one can also differentiate between smooth and saccadic movements, jerky or pendular nystagmus, and conjugate or nonconju-

gate positions of the eyes. By photographing the eyes at four-times normal speed, normal projection slows the movements so that details of the course of movement of each eye can be seen. One advantage over the methods of electro-oculography and corneal reflexion is that movements need not be restricted in plane. Although detailed information on individual muscle action, such as is revealed by electromyography, cannot be obtained from motion pictures, it is possible to make some assessment of muscle imbalance; from the patient's point-of-view, motion picture photography is preferable to a method requiring insertion of electrodes or mounting of contact lenses.

Films of a six-year-old girl with latent nystagmus proved to be of unexpected value in revealing the extent of muscle imbalance; from repeated viewing of the films this could be readily analyzed and assessed by the orthoptic technician, who was unable to obtain the patient's cooperation for such assessment. These films suggest that selected cases with muscle imbalance might be filmed before and after corrective surgery to demonstrate the extent of improvement. Such films might be of value both in teaching and in the assessment of different surgical procedures for correction of the same defect.

Films of an eight-year-old girl with voluntary nystagmus revealed that the oscillations were conjugate, pendular, uneven in extent but averaging about five degrees, and at a frequency of 12 to 15 per second (differing in different positions of gaze). Unlike Westheimer's case (*Ophthalmologica*, 128:300, 1954), there was no strong convergence movement at onset of the voluntary nystagmus. It might be of interest to accumulate a film library of such unusual cases, which would be of value in the training of ophthalmologists, orthoptic technicians, and others.

Sample films were shown to illustrate

the thesis that film recording may have value outside the research laboratory, both for teaching purposes and for the diagnosis and evaluation of selected cases with oculomotor defects.

An electromyographic study of co-contraction in human extraocular muscles.

Edward Tamler, M.D., Arthur Jampolsky, M.D., and Elwyn Marg, Ph.D., Division of Ophthalmology, Stanford University School of Medicine, San Francisco.

Co-contraction is the simultaneous contraction of muscles which are normally antagonists in their primary field of action. It has been postulated that co-contraction takes place during most eye movements. For example, as the eye is adducted or abducted, the vertical recti and obliques co-contrast to steady the eye in its course and to reinforce the movement after the prime mover has lost its mechanical advantage.

Multiple channel electromyography offers an excellent method of testing this hypothesis. Electromyography studies, in humans, revealed little, or no, co-contraction in slow following movements in the primary planes. There is isolated contraction of auxiliary muscles during eye movements in tertiary planes. Co-contraction also occurs at the start of rapid saccades, and in the stationary eye during asymmetric convergence.

Spatial perception as a function of eccentricity of retinal stimulation. F. W. Weymouth, Ph.D., Los Angeles, Professor Emeritus, Stanford University.

It is well known that visual acuity shows a marked regional gradient, being best in the fovea and declining peripherally. The few extensive determinations (Wertheim) have been figured and in some cases compared with an anatomic gradient, such as the density of the retinal cones, but, as far as known, have

not been analyzed mathematically. Because of the considerable theoretic and practical importance of this gradient it seems worth while to call attention to the following relations.

The eye is unique in that instead of a threshold, as in most senses, a sensitivity, visual acuity, has come to be the chief measure of its ability. The recognized threshold for the eye is the minimum angle in minutes that may be resolved, the minimum angle of resolution. This is, of course, the reciprocal of the Snellen fraction, therefore data may easily be transformed. If the minimum angle of resolution is plotted as a function of the eccentricity of retinal stimulation it closely approximates a straight line except in the extreme periphery. Of the other visual capacities for which regional values are available, some show a relation to eccentricity similar to the minimum angle of resolution while others are clearly not linear functions of retinal position. The former group appears to involve spatial perception in some form. Thus it includes, besides the minimum angle of resolution, the resolution of grids, vernier acuity (expressed as a threshold), the perception of motion, and such horopter values as the diameter of the Panum areas and the error of the settings of the rods.

For those cases to which the relation applies, the simplicity of the function, a straight line represented by two constants (the intercept and the slope), permits easy characterization and facilitates comparison, for example, between horizontal and vertical gradients, between testing techniques, individuals, or the like. The constants, moreover, are capable of meaningful physiologic interpretation; the intercept is the threshold of the fovea, the slope the rate of increase of the threshold with eccentricity.

A number of the suggested comparisons are presented, the common features of the

linear visual capacities are considered, and the anatomic basis of these gradients is discussed.

Clinical and laboratory experiences with the carbonic anhydrase inhibitor, dichlorphenamide. John E. Harris, M.D., Olive Beaudreau, B.S., and Gertrude Hoskinson, B.A., John E. Weeks Memorial Laboratory, Department of Ophthalmology, University of Oregon Medical School, Portland.

Dichlorphenamide (Daranide) is a new carbonic anhydrase inhibitor made available for study approximately one year ago. This compound is stated to be a more potent enzyme inhibitor *in vitro* than is acetazolamide. Current laboratory studies of dichlorphenamide have been made on the rabbit. In this animal the drug was found to induce a decrease in the potassium concentration of the serum and aqueous and the bicarbonate concentration of the plasma and aqueous. With neither substance was there a preferential decrease in the aqueous. No change in the sodium levels or the osmotic pressure of either fluid was observed. The intraocular pressure of the normal rabbit was significantly lowered. Using the degree of lowering of serum potassium as a criterion it was determined that in the rabbit dichlorphenamide was approximately five times as potent as acetazolamide. Clinical experience tended to support this finding.

The drug has been tested in the clinic for a period of seven months. It has proved to be an effective ocular hypotensive agent in those individuals who normally responded to acetazolamide. In addition it was found to provide a therapeutic success in 10 of 17 individuals where acetazolamide was a therapeutic failure. The side-effects of the drug were substantially those of acetazolamide, were no more intense and often less pronounced than those of acetazolamide.

The aqueous: plasma osmotic pressure relationship in the rabbit and cat. K. Nolan Tanner, Ph.D., and John E. Harris, M.D., John E. Weeks Memorial Laboratory, Department of Ophthalmology, University of Oregon Medical School, Portland.

Measurements of the osmotic concentrations of normal rabbit and cat aqueous and plasma have been made on the Ficke osmometer, an instrument which records the freezing point of the solution. The mean osmotic concentrations of rabbit aqueous was 294.3 milli-osmols per liter and of cat aqueous was 316.5 milli-osmols per liter. The mean aqueous-plasma difference was 1.76 milli-osmols for the rabbit and 2.10 milli-osmols for the cat both in favor of the aqueous. The animal-to-animal variation in osmotic concentration was significantly greater in the rabbit than in the cat.

The effect of two ocular hypotensive agents on the osmotic concentration of the rabbit was tested. Neither dichlorophenamide, a carbonic anhydrase inhibitor, nor dibenamine, an adrenergic blocking agent, significantly altered the osmotic concentration of the aqueous, the plasma, or the aqueous-plasma differences.

Rabbits and cats were subjected to osmotic stress, the plasma being made hypertonic by the intravenous injection of hypertonic glucose or saline and hypotonic by the intraperitoneal injection of hypotonic glucose. In the rabbit the aqueous osmotic concentration tended to follow that of the plasma. The change, either increase or decrease, of the aqueous osmotic concentration was about two thirds of the corresponding change in the plasma concentration. In the cat very little change was observed in the aqueous osmotic concentration even though the plasma osmotic concentration was widely varied.

In a number of experiments the intra-

ocular pressure and aqueous-plasma osmotic concentration difference was measured simultaneously in both normal animals and animals subjected to severe osmotic stress. In the unstressed situation measurements of the intraocular pressure were quite consistent from animal to animal in contrast to the variable aqueous-plasma osmotic pressure differences mentioned above. In these animals no consistent relationship between the intraocular pressure and aqueous-plasma osmotic pressure difference was observed. When an osmotic stress was applied some change in the intraocular pressure was observed in the anticipated direction. Present data indicate that the magnitude of these changes is greater in the rabbit than in the cat.

The tentative conclusions to be drawn are: (1) The cat secretes an aqueous of relatively constant osmotic strength when presented with variable osmotic pressures in the plasma whereas in the rabbit the aqueous osmotic pressure tends to follow that of the plasma; (2) the cat possesses a more effective homeostatic mechanism for maintaining its intraocular pressure than the rabbit.

The movement of I¹³¹-labeled insulin into the anterior chamber. Kenneth M. Giles, B.S., and John E. Harris, M.D., John E. Weeks Memorial Laboratory, Department of Ophthalmology, University of Oregon Medical School, Portland.

The following studies were conducted to determine whether insulin normally enters the aqueous. To this end 50 μ c./kg. I¹³¹-insulin were injected intravenously into rabbits and the radioactivity of five-percent trichloroacetic acid precipitable and trichloroacetic acid soluble material in the plasma and aqueous was measured at various time intervals. The I¹³¹-labeled insulin is precipitated by the procedure employed.

The trichloroacetic acid precipitable activity in plasma dropped rapidly from its initial peak to a relatively low level at two hours. From two to 10 hours after injection this level of activity remained essentially constant. The trichloroacetic acid soluble fraction reached a peak in about one hour and then slowly decreased.

Trichloroacetic acid precipitable activity in the aqueous reached a maximum at about one hour after injection and then decreased fairly rapidly to a stable low level.

To determine what proportion of this protein bound activity was insulin paper electrophoretic studies were done, consecutive one cm. strips up to 10 cm. from the origin being counted. I^{131} -insulin alone did not migrate. However, when unlabeled insulin was added to raise the concentration, the labeled insulin migrated to the point corresponding to the stainable insulin band. The addition of aqueous to either system did not alter the mobility patterns. The addition of serum albumin to I^{131} -insulin did not promote

the characteristic migration of the labeled insulin. It was reasoned, therefore, that in the absence of carrier insulin, and in the presence of carrier albumin, that activity remaining at the origin was probably insulin.

Paired aqueous samples taken 30 minutes after intravenous administration of I^{131} -insulin showed a relatively large amount of activity which remained at the origin when aqueous alone was added to the strip but which to a large degree migrated when carrier insulin was included.

When carrier albumin was added some of the protein bound activity migrated, the proportion increasing as the time after the injection increased. The protein bound activity remaining at the origin under these conditions and thus attributable to insulin reached its peak in approximately 30 minutes. This is compatible with the finding that the half-life of insulin is around 30 minutes. The insulin concentration of the aqueous may be as great as one tenth that of the plasma, a surprisingly high level.

THE ASSOCIATION FOR RESEARCH IN OPHTHALMOLOGY

Future Meetings

MIDWESTERN SECTION:	Saint Louis, Missouri, April 21, 1958 Bernard Becker, M.D., chairman, 640 South Kingshighway Boulevard, Saint Louis, Missouri
NATIONAL MEETING:	San Francisco, California, June, 1958 Lorand V. Johnson, M.D., secretary, 10515 Carnegie Avenue, Cleveland 6, Ohio

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

CHICAGO OPHTHALMOLOGICAL SOCIETY

March 18, 1957

DR. KENNETH L. ROPER, *president*

The Suker Memorial Clinic was held at
Cook County Hospital at 4:00 P.M.

DRUSEN OF THE OPTIC NERVE

DR. GEORGIANA THEOBALD showed fundus pictures of these lesions and corresponding histologic sections.

SOLUBLE HYDROCORTISONE AND PREDNISOLONE

DR. WARREN W. KREFT reported his experiences with the newer soluble steroid preparations. A group of 75 patients was treated with soluble hydrocortisone and a second similar group with soluble prednisolone. All therapy was by local instillation of a 0.2-percent solution. The various clinical entities treated were allergic conjunctivitis, vernal conjunctivitis, phlyctenular keratoconjunctivitis, episcleritis, and nongranulomatous iritis.

Dr. Kreft felt that the response shown to these medications was easily as good as that to the usual suspensions. In addition, there was a complete absence of complaints of burning, stinging, and foreign-body sensation, so commonly reported by patients using the ordinary suspensions of the steroids. The two soluble preparations appeared to be about equally effective.

ETIOLOGY OF ENDOGENOUS UVEITIS

DR. T. F. SCHLAEGEL of Indianapolis presented an excellent paper in which he reviewed the usual etiologies of endogenous uveitis. However, he presented a concise, logical scheme for the investigation and a simple system of recording the results. By

and large Dr. Schlaegel felt he obtained most information from skin tests and from therapeutic tests with Isoniazid and penicillin. Daraprim was a less valuable tool. Blood and urine examinations and X-ray studies were found to be valueless.

Dr. Schlaegel then presented a fascinating study of the psychosomatic factors associated with exacerbations of endogenous uveitis. He briefly related several case histories where the sudden burden of added responsibility seemed to provoke an attack of uveitis. Dr. Schlaegel and his group are now engaged in controlled studies of the "terrain" in which uveitis occurs.

Discussion. DR. FRANK W. NEWELL: Dr. Schlaegel has indicated how far the pendulum has swung in defining the etiology of uveitis. His findings parallel our experience so closely that one may only emphasize some of the points he has made. At our institution, the majority of the cases of uveitis in which the etiologic factor is recognized occur in patients who have been followed on one of the medical services in which the uveitis occurs as a complication of the primary disease. Thus we have seen many patients with sarcoidosis, a few with ulcerative colitis, an occasional luetic, Behçet's disease, Vogt-Koyanagi syndrome, Still's disease, and the like. In patients presenting themselves initially with uveitis to the eye clinic, the identification of the etiologic factor is discouragingly rare. Uveitis, however, may be a fairly common disease and patients may have a single attack with no recurrence. This may be concluded from the frequency with which posterior synechia or a healed patch of chorioretinitis is seen on routine examination with no history of previous inflammation. The patients seen in the ophthalmologists' offices represent the residue who have recurrent inflammation.

The laboratory findings of Dr. Schlaegel

are those which have been found by other workers in this field but his emphasis is far different. As a group, patients with uveitis tend to have the blood picture associated with inflammation: an elevated sedimentation rate, a positive C-reactive protein, positive antistreptolysin titers, positive antihyaluronidase, and the like. Unfortunately, these figures may be derived only for the group and are not helpful for the individual patient. Our chest people have emphasized to us the danger of inadequate treatment with Isoniazid and para-aminosalicylic acid. (We no longer use streptomycin.) If there is improvement of the ocular status with the therapeutic use of these antituberculosis agents, treatment must be continued for six months, if one is not to prejudice these patients with the development of resistant strains of tuberculosis. If there is no improvement, it is safe to discontinue the therapeutic tests after three weeks.

Dr. Schlaegel's extensive and early experience with Daraprim is very important to us—particularly his emphasis on depression of the bone marrow. If Daraprim is used, blood counts must be done at least once or twice weekly. Some of our hematologists believe that depression of the bone marrow does not represent an idiosyncrasy of the patient to the drug but is an expected pharmacologic action when the Daraprim is used in adequate dosage.

There is no one in the country more competent to discuss the factor of stress in the etiology of uveitis than Dr. Schlaegel. Certainly we have all known patients who have developed uveitis while emotionally disturbed. Undoubtedly these factors are going to become more and more important as investigators such as Dr. Schlaegel define their role.

FOREIGN BODIES IN INTRAOCULAR SURGERY

DR. CLEMENS KIRCHGEORG mentioned lint, rubber, glass, gold, and talc as foreign bodies that may be introduced into the eye during intraocular surgery. He then enumerated

various measures to be taken to avoid this problem. These include autoclaving pans, and so forth in bags, the use of plastic sponges, and the instillation of an electronic air cleaner. The problem of glove powder was simply solved by dispensing with gloves for intraocular surgery. He also felt that irrigation of the anterior chamber should be avoided as much as possible.

David Shoch,
Recording Secretary.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

435th meeting February 20, 1957

DR. EDWARD A. CRAMTON, *presiding*

CASE PRESENTATIONS

CONGENITAL CATARACT

DR. PETER BECK: This seven-year-old boy's mother had rubeola in the 10th day of her pregnancy. The infection lasted five weeks. The child was born at full-term and weighed slightly under four pounds. The weight dropped one and one-half pounds soon after birth and the child spent two months in an oxygen incubator. He developed a host of congenital anomalies. He was a bleeder at birth; his right leg was two and one-half inches shorter than his left—they are now equal. He had a congenital hearing defect. His right testicle has since descended with massage. He was born with the typical spots of German measles. He also had an umbilical hernia which seems to have cured itself.

His right eye has a congenital cataract and is microphthalmic. The right pupil is slightly smaller than the left but both react well to light. In the left eye the patient has marked nystagmus with the fast phase to the left. This is much accentuated when he looks to the left and is almost absent on looking to the right. He also has rotary nystagmus in both eyes. There is no fundus reflex in the right eye. In the left eye the media are clear

and the disc is pale. There is some pigment disturbance in the macular area. His vision in the left eye, with or without glasses, is 20/40.

The problem is whether anything is to be gained by doing a cataract operation on the right eye. The light projection in this eye seems to be good, although there is some doubt about it. Sometimes, nasally, vision is limited. Would anything be gained by operation so that the nystagmus, which is now almost gone when he looks to the right, would be lessened in the primary position? He now compensates for this very well by merely turning his head, so maybe surgery would be unnecessary.

Discussion. DR. EDWIN B. DUNPHY: Is a functional or cosmetic result desired? If it is cosmetic, my experience has been not to try it. If it is functional, I doubt if this child will have any real vision after the cataract extraction. I would not recommend anything for the nystagmus.

This is the first case I have heard of unilateral cataract following maternal rubella. The skin lesions on the infant are most unusual. I can't help wondering about them.

DR. EDWIN B. GOODALL: I have examined in the laboratory many specimens of microphthalmic eyes. Many of them have membranes that extend across the iris and a lot of them have cataracts. Most all of them have colobomas and defective optic nerves. I think if any surgery were done on this eye the result would be only cosmetic; there is very little likelihood of any vision.

UVEITIS

DR. JOSEPH L. DOWLING: Three months ago this 77-year-old man came to the clinic with a complaint of blurring vision that was progressive. He had no other symptoms.

Examination of the eyes showed a mild injection of the conjunctiva, the corneas were clear with the exception of the endothelium which was covered with a great myriad of mutton-fat keratic precipitates. There was a one- to two-plus flare in each

anterior chamber. Only a few cells could be seen. The condition of the endothelium prohibited too close an examination. The pupils were small and obviously pretty much bound with posterior synechias. An interesting feature was that, around each pupillary margin on the iris, there was a great ring of dilated vessels. The suggestion of a red reflex could be seen. Vision was: O.D., 16/40; O.S., 16/80. Tension was: O.D., 13 mm. Hg; O.S., 15 mm. Hg (Schjötz).

The patient was admitted to the hospital and given a routine uveitis workup which was essentially normal with the exception of an elevated sedimentation rate. Physical examination showed thickening of several of the joints. A history of about three months of joint pains was elicited at this time. It was thought by the medical consultants that at the age of 77 years this man had developed acute rheumatoid arthritis.

For his eyes the man was given intensive mydriatics by drop and subconjunctival injection and by tampon in the conjunctival sac. There was apparent effort on the part of the pupils to dilate but no dilatation. He was placed on 40 mg. of Metacorten daily for his arthritis. He did very well for five to six days. On about the fifth day the patient said his vision was normal and his eyes felt normal. However, examination revealed considerable epithelial edema. The tension was: O.D., 60 mm. Hg; O.S., 55 mm. Hg. Vision was found to be less than 16/20 in both eyes. The eyes were otherwise normal.

The patient was placed on large doses of Diamox and the tension fell rapidly, within eight hours the tension was down to 14 mm. Hg in each eye and it has stayed there on relatively small doses of Diamox. Vision is now O.D., 16/30; O.S., 16/40.

This case has been presented to point out that we cannot rule out active rheumatoid arthritis even at the age of 77 years. It also points out that, when uveitis is treated with cortisone, we may get a rise in tension which will not warn the patient by symptoms. Such patients should be watched very carefully.

ELECTRONIC FLASH AFTER-IMAGE TESTER

DR. ROBERT R. TROTTER: The usual methods of testing the presence or absence of normal retinal correspondence have been largely unsatisfactory in children under the age of six years because of the inability of the younger and some of the older children to fix unwaveringly for the required length of time and because of the difficulty in making the child understand what is wanted.

This improved after-image test employs an electronic flash tube as a stimulus. The tube is caused to flash for less than $1/1,000$ of a second by instantaneously discharging through it 2,000 or more volts supplied from condensers charged from a circuit commonly used in electronic photographic equipment. The flash tube is mounted on an arm in such a way that it can be rotated manually for 90 degrees. The leads are enclosed.

The patient stands or sits about one meter from the flash tube. Satisfactory fixation is obtained by asking the patient to look carefully at a target at the center of the flash tube.

The nondominant eye is covered and the dominant eye is instantaneously exposed to the flash from the horizontally placed tube. This is followed as soon as the condensers recharge, 15 to 20 seconds, by exposure of the nondominant eye, with the dominant eye covered, to the vertically placed tube. The patient is now asked to look at a blank wall and to blink rapidly. He is then asked to draw on a slate or a piece of paper what he sees.

One group of 119 consecutive patients were tested without regard to visual acuity. In this series the old method of a slide in a major amblyoscope was employed and this was followed by the electronic flash after-image test a few seconds later. The patients were aged three to 19 years. Percentagewise, the old method was successful in something less than half the cases—44.5 percent. The new test was successful in 89.11 percent of the cases.

It was felt that some of the patients may

have received clues from the old test so we ran a second series of tests on 56 consecutive patients, using only the electronic flash after-image test; 87.5 percent of these patients responded satisfactorily.

It is concluded that the after-image test can be carried out with almost double effectiveness if an electronic flash tube is used instead of an elongated incandescent filament or a slide in a major amblyoscope. The need for prolonged fixation is made less with the electronic flash tube. We think that the light output with this device is so great that, in spite of its short duration, the stimulus is stronger. We have found many children as young as three years of age who can be satisfactorily tested with this improved method; whereas, with the old method successful tests were unusual under the age of six years.

Charles Snyder,
Recorder.

TRANSACTIONS OF THE
AMERICAN OPHTHALMOLOGICAL
SOCIETY FOR 1956

Volume 54

At the 92nd annual meeting of the American Ophthalmological Society the following scientific program was presented:

ROUTINE TONOMETRY

DR. H. ROMMEL HILDRETH and DR. BERNARD BECKER showed that, in a series of approximately 2,000 routine refractions of patients over the age of 40 years, routine tonometry revealed borderline tonometry readings in 49 patients who were otherwise normal. This group of patients had repeated measurements of scleral rigidity and tonographic tracings before and after water-drinking tests. On the basis of these examinations of 97 eyes, 68 (72 percent) were classified as glaucoma suspects; of this group, 27 (39 percent) developed early field loss during a six- to 18-month period. Routine use of the Schiøtz tonometer is capable of detecting early glaucoma. The diagnosis

in questionable cases may then be confirmed by additional study.

CHANGES IN INTRAOCULAR PRESSURE OF THE OTHER EYE DURING TONOGRAPHY

DR. FREDERICK W. STOCKER said that the changes in intraocular pressure after tonometry and tonography were studied in 60 cases. If tonometry is immediately repeated, the fall of pressure is negligible; if repeated in four minutes, the intraocular pressure is definitely lower. The mechanism of these changes is speculative.

INFLUENCE OF CYCLODIATHERMY ON CHOROIDAL CIRCULATION

DR. IRVING H. LEOPOLD and DR. GERARD M. SHANNON showed 27 photographs of gross and microscopic changes which indicated alterations in the choroidal circulation produced in rabbits by retrociliary diathermy. The changes shown by transillumination and by plastic casts are most instructive. The dangers and results of the clinical use of cycloidiathermy were stressed in the discussion of the paper.

UVEITIS IN ASSOCIATION WITH RHEUMATISM

DR. MICHAEL HOGAN, DR. PHILLIPS THYGESON, and DR. SAMUEL J. KIMURA discussed the classification of rheumatic diseases used by the American Rheumatism Foundation: (1) Infectious arthritis (tuberculosis, brucellosis, syphilis, pneumonia), (2) arthritis in rheumatic fever, (3) rheumatoid arthritis, (4) gouty arthritis, (5) symptomatic.

The systemic pathology was concisely reviewed. Rheumatoid arthritis is the most important condition of the group. Recurrent attacks of iritis and iridocyclitis are encountered in three percent of rheumatic victims. The clinical findings, course, and terminal ocular states were reviewed for each group, along with some remarks on therapy. (Thirty-eight cases of rheumatoid arthritis form the basis of this excellent clinical study of rheumatism which ranks first in incidence,

and second to nervous and mental disorders in producing disability.)

OPHTHALMOLOGIC HYDROSTATIC PRESSURE SYNDROME

DR. DONALD J. LYLE, DR. JOHN P. STAPP, and DR. RICHARD BUTTON described this syndrome, which is produced by a rapid deceleration in ejection from planes at supersonic speeds or by compressive injuries of the lower chest or abdomen, transmits pressure through the blood vessels to the head and face, causing a rise in hydrostatic pressure. These injuries produce signs of cerebral concussion with confusion, retrograde amnesia, circulatory shock, temporary loss of vision, retinal and subconjunctival hemorrhages, ecchymosis of the lids, and periocular edema. The paranasal sinuses are congested and even hemorrhagic. The retinal changes, hemorrhages, and scotomas are slow in clearing. Brain damage was not encountered.

TOXIC CHORIORETINOPATHY FOLLOWING NP207

DR. EVERETT L. GOAR and DR. MARY C. FLETCHER said that following the successful use of Thorazine as a tranquilizer, a search was made of phenothazine derivatives which would be equally effective and without the harmful side effects of Thorazine. NP207 was one such preparation so tested. Of 34 cases treated at the Jefferson Davis Hospital of Houston, Texas, 28 had some sign of retinopathy. The ocular damage was recognized four to eight weeks after the drug was used. Eight patients became practically blind, four showed moderately severe changes and 16 mild. The late fundus lesions were quite similar to those of retinitis pigmentosa. The use of the drug at the Mayo Clinic, where smaller dosage (300 to 400 mg. daily) was given, was not complicated by visual impairment. The late sequelae of tranquilizers are often unknown.

PROLIFERATIONS IN THE VITREOUS

DR. ARTHUR J. BEDELL presented several

cases of fibrous proliferations in the vitreous by serial single and stereoscopic photographs. The correct location of intraocular membranes demands extreme accuracy. Serial stereoscopic photographs are instructive and valuable.

HETEROCHROMIC UVEITIS AND CATARACT

DR. FREDERICK H. VERHOFF discussed a patient who showed uveitis and cataract in one eye and esotropia in the other, as well as latent nystagmus. Cataract extraction was performed, with excellent vision with both eyes in use.

DIAMOX TO PREVENT HYPHEMA AFTER CATARACT EXTRACTION

DR. DERRICK VAIL reported that, in a series of 100 patients following cataract extractions, Diamox (250 mg.) was given twice daily from the third to ninth postoperative day. Diamox did not prevent the late loss of the anterior chamber and had no effect on the prevention of wound reopening and hyphema after cataract operations. Factors causing wound ruptures and hyphema were discussed.

FIELDS WITH REDUCED ILLUMINATION IN GLAUCOMA

DR. SEARLE B. MARLOW found the use of reduced illumination, 0.20 foot-candles, combined with small test targets, of value in revealing early field changes in chronic glaucoma. Loss of visual field vision detected by this method may be an indication for operation.

ANATOMIC STUDY OF VERTICAL MUSCLES

DR. WALTER H. FINK studied the complicated anatomy of the vertically acting ocular muscles in live and fresh specimens in an attempt to explain their check mechanism which permits a smooth action in contraction and restricts the action when ocular rotation reaches a certain point.

EXOPHTHALMOMETRY

DR. LESLIE C. DREWS gave the historical

background of exophthalmometry, the instruments used, the sources of error, and the techniques. He also described a new simple, reliable exophthalmometer.

METHOD OF CATARACT EXTRACTION

DR. ARTHUR C. UNSWORTH used a lens forceps of the double ring type. The anterior blade is essentially a wire loupe, the posterior blade is flat and round. After the zonule is ruptured, the flat solid blade of the forceps is introduced between the vitreous face and the lens capsule. The anterior ring loupe of the forceps is introduced between the lens face and the posterior corneal surface. The forceps is closed gently. The lens is then drawn upward and out of the eye. The use of the forceps permits pressure to be less to the eye in delivering the lens.

FLASH BURNS IN RABBIT RETINA

DR. DUPONT GUERRY, III, and his collaborators described the method used in producing small retinal burns. The damage is confined mostly to the pigment epithelium, rods, and cones, and the inner nuclear layer of the retina.

CHANGES IN FLOW OF AQUEOUS HUMOR AND BLOOD AQUEOUS BARRIER

DR. JAMES H. ALLEN, JOHN W. MANNING, JR., MARION A. GUIDRY, and JOYCE B. KELLY said that their results show that there is an increase in the rate of flow of aqueous humor, as well as an increase in the permeability of the blood-aqueous barrier in rabbit eyes which have been treated with hydrochloric acid solution.

RADIOACTIVE PHOSPHORUS IN TUMOR DETECTION

DR. EDWIN B. DUNPHY, DR. JOSEPH L. DOWLING, JR., and DR. ALFRED SCOTT said that the use of radioactive phosphorus (P^{32}) has been of value as a diagnostic aid in recognizing malignant intraocular tumors which, if accessible to the application of the Geiger counter, give a substantial increase in counts.

POIKILODERMA CONGENITALE

DR. CECIL W. LEPARD said that this congenital disease is characterized by rapidly developing cataracts occurring in children between the age of four and six years. There is an associated dermatosis of the face and extremities. Two cases are reported.

MALIGNANT GLAUCOMA

DR. HENRY L. BIRGE: Malignant glaucoma is a form of secondary glaucoma caused by a forward displacement of the lens. It is not classified under angle-closure glaucoma. The operation of choice in malignant glaucoma is lens extraction combined with a filtration procedure performed at one operation.

EVISCERATION

DR. CONRAD BERENS, DR. GEORGE Z. CARTER and DR. ARNOLD S. BREakey gave the indications for evisceration, the technique used, and the complications encountered. In selected cases, evisceration with an intrascleral implant is preferred to enucleation. A more natural appearance of the eye and an increased mobility of the prosthesis are obtained.

EVISCERATION WITH RETENTION OF CORNEA

DR. A. D. RUEDEMANN: The contraindications for evisceration are: (1) the presence of a tumor within the globe, and (2) the possibility of causing sympathetic ophthalmia. A technique of evisceration is described. The intrascleral implant may be a plain polyethylene sphere or a mesh-covered ball, 18 to 20 mm. in size. The prosthesis is fitted as a contact lens and is called a contact shell. A most excellent cosmetic result is reported.

BILATERAL RECURRENT SEPARATION OF RETINA

DR. JOHN S. MCGAVIC: The retinal separations in one patient were recognized as being of systemic etiology. They became reattached after the use of thyroid extract. The upper limit of tolerance was 0.8 gr. of thyroid daily. The patient was quite allergic. The etiology of the retinal separation is obscure.

The following theses accepted for membership in the American Ophthalmological Society are included in the *Transactions*:

1. "The relationship of fields of vision to safety in driving," Ralph W. Danielson.
2. "A study of the actions of nonaromatic quaternary ammonium compounds on the eye," W. Morton Grant.
3. "Essential blepharospasm," John Warren Henderson.
4. "Lens materials and the prevention of eye injuries," Arthur Hail Keeney.
5. "Keratoplasty: Experimental studies with corneas preserved by dehydration," John Harry King, Jr.
6. "A clinical study of radiation cataracts," George R. Merriam, Jr.
7. "Comparative effects of cycloelectrolysis versus cyclodiathermy on the normal rabbit eye," L. Benjamin Sheppard.
8. "The relation of the volume of the crystalline lens to the depth of the anterior chamber," Daniel Snyder.
9. "The vitreous: Gross and microscopic observations seen in age and disease with special emphasis on the role of vitreous in detachment of the retina," Joseph A. C. Wadsworth.
10. "Retinal neovascularization," George N. Wise.

William M. James,
Reviewer.

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Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor*, Mrs. Katherine F. Chalkley, Lake Geneva, Wisconsin. Fifty reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Company, Inc., 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

THE NATIONAL COMMITTEE FOR RESEARCH IN OPHTHALMOLOGY AND BLINDNESS

Organization of the National Committee for Research in Ophthalmology and Blindness was prompted by the four national ophthalmic organizations—the Section on Ophthalmology of the American Medical Association, the American Ophthalmological Society, the Association for Research in Oph-

thalmology, and the American Academy of Ophthalmology and Otolaryngology. The establishment of such a committee seemed desirable because of the increased funds available to research, the greater number of physicians and scientists devoting full time to research in this field, and the interest of

certain lay organizations in transferring their major efforts to blinding disease.

In addition, it was recognized that there was a dearth of qualified ophthalmic scientists, both in the clinical and fundamental fields, and that public interest in blinding disease did not parallel the extreme needs in the area. It was further recognized that much research was required in the field of sensory devices and educational methods to benefit those already blinded. It, therefore, appeared wise for representatives of organized ophthalmology to take the initiative in forming a group to stimulate research and to describe the accomplishments as well as the problems presented in the study of blinding diseases and blindness.

The National Committee for Research in Ophthalmology and Blindness has been organized on an informal basis without a complicated administrative structure. An unpaid secretary-treasurer is the only officer and he is responsible for transmitting the activities of the committee to interested persons. It has never been the purpose of the committee to establish a new medical or educational agency or to organize a major central office. Clerical expenses have been met by money appropriated by the ophthalmic organizations which prompted formation of the committee.

In keeping with its simple administrative structure, the National Committee for Research in Ophthalmology and Blindness does not propose to solicit funds or to interfere with the activities of any organization in the field of public relations, service, education, or research. The committee, moreover, recognizes clearly that these important functions must continue and must be much expanded, and that any attempt on its part to channel funds from these functions into laboratory, clinical, or medical studies would be a disservice to ophthalmology, the public, the patients with blinding disease, and the blinded.

Meetings of the National Committee for Research in Ophthalmology and Blindness

have been held on June 4, 1957, at the Waldorf-Astoria Hotel in New York, and on October 15, 1957, at the Palmer House in Chicago. The following organizations, each of which has an interest in this field, were represented:

Alfred P. Sloan Foundation, Inc.
American Association of Instructors of the Blind
American Association of Workers for the Blind
American Foundation for the Blind, Inc.
American Legion
Delta Gamma Foundation
Eye-Bank for Sight Restoration, Inc.
Heed Ophthalmic Foundation
Lions International
National Committee for Research in Neurological Diseases
National Council to Combat Blindness, Inc.
National Foundation for Eye Research
National Industries for the Blind
National Institute of Neurological Diseases and Blindness
National Science Foundation
National Society for Prevention of Blindness
Ophthalmological Foundation
Seeing Eye, Inc.
American Academy of Ophthalmology and Otolaryngology
Section on Ophthalmology, American Medical Association
American Ophthalmological Society
Asia-Pacific Academy of Ophthalmology
Association for Research in Ophthalmology

Other national groups with similar interests are welcome to join the committee and failure to be represented at these meetings may only indicate that difficulty was encountered in contacting them. However, those organizations represented are in agreement with the general aims of the committee and are doing what is possible to co-operate with its purposes.

Because the committee is a loose federation of workers interested in many different aspects of and a variety of methods in approach to the problems of ophthalmic research and blindness, it is believed that it should function as a forum where these groups can express their views. While each group participates in the work of the committee, none can be described as being a member of the committee or as having the committee represent it in any effort.

It is hoped that the National Committee for Research in Ophthalmology and Blindness can serve to integrate the present efforts in promoting research into blinding diseases and blindness. The committee is prepared to provide consultation concerning research to any individual or group requesting such advice. It is felt that those already working in this area have competent medical and lay direction and that it would be presumptuous for this committee to suggest changes in their current activities. However, newcomers to the field may wish to learn in what areas research is being done, what subjects are worthy of attention, and how they can best localize their resources to be most effective.

The following committee projects are now under way:

1. Preparation of a list of the sources of funds and assistance available for research in ophthalmology and blindness with wide

distribution of this list. It is anticipated that this will be completed by December 31, 1957, and will be published in *THE AMERICAN JOURNAL OF OPHTHALMOLOGY* and the *A.M.A. Archives of Ophthalmology*, and that there will be wide distribution of reprints.

2. Provision of a central directory service, and listing of research projects already existing in the field to indicate what studies are already under way and perhaps to prevent duplication.

3. The encouragement of the establishment of training centers for ophthalmic scientists and ophthalmic research laboratory technicians.

4. Active encouragement of research in the field of ophthalmology and blinding diseases by the departments of medicine, pediatrics, obstetrics and gynecology, psychology, and the like in various medical centers.

5. Advisory assistance to those interested in ophthalmic research, particularly stimulation of research in areas where study is needed, with assistance in seeking financial aid and technical personnel.

Frank W. Newell,
Secretary-Treasurer

The National Committee for Research
in Ophthalmology and Blindness
Committee Office:
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Evanston, Illinois

TRACHOMA DUBIUM

The article by Dr. Lee Cady in this issue directs attention to the problem of diagnosing trachoma in its earliest stages. Trachoma of acute or subacute onset has never been a serious diagnostic problem since corneal changes occur simultaneously with conjunctival changes, and pannus, either microscopic or gross, is early in evidence. It is the trachoma of insidious onset, seen often in young children, that poses the problem, particularly in areas in which trachoma is uncommon.

Ophthalmologists who have examined

school children in the trachomatous countries of the Middle East or Asia, or among our American Indians, have been struck by the sharply diagnostic picture of the upper tarsal conjunctiva in Stage I trachoma; immature, translucent, only slightly elevated follicles are scattered over the tarsal plate and are surrounded by red, velvety papillary hypertrophy. In this stage the cornea is often grossly normal. Slitlamp examination, however, almost invariably reveals extension of capillary loops at the upper limbus, associated with fine, subepithelial infiltrates, with epithelial keratitis and, occasionally, with

limbal follicles. If there is no slitlamp available and the conjunctival picture is atypical with respect to follicle formation or distribution, the diagnosis of "trachoma dubium" or "suspected trachoma" is in order.

In countries with a high trachoma index, it is important to decide how to deal with these doubtful cases, particularly in surveys of school children. There would seem to be justification for including them in any treatment program that is instituted since topical treatment with broad-spectrum antibiotics is effective and carries no risk. When the incidence of trachoma is low, as in the white population of the United States, cases diagnosed as trachoma dubium should in every case be checked by slitlamp examination of the cornea. If there is no extension of limbal vessels and no keratitis of any kind, trachoma is most unlikely and can probably be ruled out definitively by re-examination after an interval of several months.

When a case of trachoma dubium is found in a trachomatous family, the laboratory may be able to aid in the differential diagnosis. Cytoplasmic inclusion bodies are found regularly in trachoma at onset, even in the incubation period, and the trachomatous follicle shows characteristic degenerative changes that can be recognized in expressed follicular material stained with Giemsa.

Dr. Cady's paper shows clearly that most cases labelled "trachoma dubium" on first examination, fail to show any evidence of trachoma when re-examined after several months.

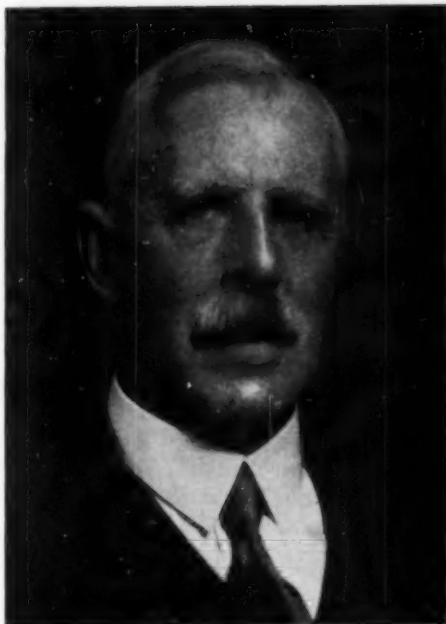
Phillips Thygeson.

OBITUARY

JOHN HERBERT PARSONS

(1868-1957)

Ophthalmologists from all over the world will mourn the death of Sir John Herbert Parsons, C.B.E., D.Sc., LL.D. F.R.C.S., F.R.S., on October 7, 1957, in London, in the 90th year of his life. They will mourn not for him, for his life was long, splendid,



SIR JOHN PARSONS

and fulfilled, but for the passing of an epoch the great figures of which have all left the stage—with the exception of Verhoeff.

As with medicine as a whole, the history of ophthalmology can be divided into stages. The stage of its glory stemmed partly from the stimulus provided by the discovery of the ophthalmoscope by Helmholtz and the subsequent intensive study of clinical conditions inaugurated by von Graefe, Bowman, and Donders, and partly from the elaboration of the compound microscope which led to the enunciation of the theory of cellular pathology by Virchow and the equally intensive study of ocular pathology. This epoch started in the middle of the last century and reached fulfilment in the first decade of the present century. Today, a new era has dawned wherein men strive to look beyond clinical pictures and gross cellular pathology, wherein advances lie in biophysics and biochemistry, wherein to describe the structural ruins which disease has left behind is no longer sufficient, but men must look into the more intimate universe within the cell and

trace the initial defect in terms of chemical histopathology.

Parsons was one of the great figures in the latter part of the first era. A great clinician and a friend of such men as de Schweinitz and Wilmer, he summarized clinical ophthalmology in his outstanding textbook, *Diseases of the Eye*, which first appeared in 1905 and, although now under other authorship, is still running into succeeding editions. A great pathologist and a friend of Verhoeff, he consolidated ophthalmic pathology in his massive four-volumed textbook, *The Pathology of the Eye* (1904-1908), and established it for the first time as an integrated, self-contained discipline. But Parsons did more than that. To him clinical and pathologic ophthalmology were insufficient; he must know all the workings of the visual apparatus—its optics, its physiology, its neurology, and its psychology. In his earlier years, a contemporary of Leber, he sought to explain the secrets of the circulation of the aqueous humor and the control of the intraocular pressure. In his later years he strove to rationalize the psychology of vision, in danger of becoming lost in clouds of theory based on subjective explorations, and consolidate it on a biologic basis. More important still, he was a prophet who foresaw where the future of ophthalmology lay. "Advances in the treatment of cataract," he said at a time when his contemporaries could not understand, "lie in the study of the biochemistry of the lens; of glaucoma in the elucidation of the dynamics of the intraocular fluid." The latter part of his life was spent in insuring that this should be done in Britain. Like a great bridge he spanned the chasm between one era and the next, and, by the force of his character, his unusual ability, and his transparent honesty, he succeeded.

Parsons was born in Bristol, England, on September 3, 1868. Aided by scholarships throughout his course, he studied science and medicine first at Bristol University and later in London at St. Bartholomew's Hospital.

In 1890, he took the degree of B.Sc. with honors in physiology; in 1891 he qualified in medicine. After qualification he served as assistant in the physiology department of University College London and then went in for general practice in London. But, through physiology, his interests centered on ophthalmology and he became a clinical assistant at Moorfields Eye Hospital. Taking his F.R.C.S. England, in 1900, aided by a British Medical Association scholarship, he gave up general practice and threw himself into the whole-time pursuit of ophthalmology with an intensity of purpose and brilliance of achievement rarely equalled. Stepping from the post of pathologist at Moorfields, he was elected to the consulting staff in 1904; he occupied a similar position at University College Hospital, London, and at the Hospital for Sick Children, Great Ormond Street. Meantime, and until the commencement of the second World War, he conducted a large consultant private practice.

These clinical activities, however, were outshadowed by his achievements in research. It is true that he contributed lavishly to clinical literature: he made some 140 contributions to the *Transactions of the Ophthalmological Society of the United Kingdom* alone. But his real interests were more fundamental. He refused to use an ophthalmoscope or refract a patient unless he understood the optical theories involved, and his first book, *Elementary Ophthalmic Optics* (1901) was so "un-elementary" that few read it. There followed a summary of his physiologic researches—*The Ocular Circulation* (1903), and a series of classical researches on ophthalmic neurology, particularly on the innervation of the pupil. In rapid succession there appeared his *Diseases of the Eye*, so good that it attained the largest circulation in the English-speaking world as a teaching manual, and his classical *Pathology of the Eye* which established his position as a world authority. Thereafter his contributions to our literature were devoted largely to the study of visual perceptions and

the psychology of vision. His *Introduction to the Study of Colour Vision* (1915) was, and still remains, an authoritative reference textbook on this subject, and it was followed by *Mind and the Nation, a Study of Applied Psychology* (1918), *An Introduction to the Theory of Perception* (1927)—the greatest book he ever wrote—and, in the evening of his life, a small monograph, *The Springs of Conduct* (1950) in which were summarized his neuropsychologic theories with their firm biologic basis.

In addition to this scientific output, Parsons entered enthusiastically into ophthalmologic activities. He was president of the Ophthalmological Society of the United Kingdom in 1925, of the Section of Ophthalmology of the British Medical Association in 1923, and again in its centenary year in 1932. He was the only ophthalmologist to become president of the Royal Society of Medicine (1936-38). He was largely responsible for the foundation of the British Council of Ophthalmologists and its replacement by the Faculty of Ophthalmologists. He was a member of a large number of committees set up by the Royal Society, the British Medical Association, and the government on subjects as diverse as glass-workers' cataract, miners' nystagmus, or the causes and prevention of blindness. He was chairman of the editorial committee of the *British Journal of Ophthalmology* for 22 years, from its foundation in 1917. More important than these, however, he became a member of the Medical Research Council, the government agency which finances and encourages medical research in Britain, and succeeded in ensuring that research on visual problems was considered of such scientific and national importance as to receive continued support from that body.

He also gave much service to his country. Throughout the first World War he served as an ophthalmic consultant in the rank of Colonel. After the war he joined the advisory medical council of the Air Ministry and of the Admiralty; and just before the

second World War he became a consultant to the Royal Air Force.

For all these contributions he received many honors. In 1904 he received the Middlemore Prize, and again in 1914. There followed the Nettleship Medal (1907), the Doyne Medal at Oxford (1919), and the Bowman Lectureship (1925). He received the honorary degrees of D.Sc. from the University of Bristol, of LL.D. from Edinburgh. His scientific achievements were recognized by his election as a Fellow of the Royal Society in 1921; while his war service was rewarded by the State by his becoming a Commander of the British Empire in 1919, and his general services to the community by the conferment of a knighthood in 1922.

In the international relationships of ophthalmology, Parsons was also a prominent figure. After the first World War he bent his powerful advocacy to the re-establishment of scientific fellowship between the nations. Together with deSchweinitz and Parker, he was one of the moving spirits in organizing the successful English-speaking Congress in London in 1925, and took a prominent part in the formation of the International Council of Ophthalmology and in the arrangement of the first post-war International Congress in Holland in 1929. But his happiest relationships were with the United States of America. To that country he made two official visits. In 1929, he took an official part in the opening of the Wilmer Institute of The Johns Hopkins University, and in 1936 he returned as the guest of the American Academy of Ophthalmology and Otolaryngology and was presented with the Lucien Howe Medal of the American Ophthalmological Society. Among his closest friends were American colleagues, and his meetings and correspondence with such figures as deSchweinitz, Wilmer, Wheeler, Derby, and Knapp—all of them now dead—were among his greatest joys.

As an individual Parsons was misunderstood by many. His outlook on life was essentially biologic and scientific; pretense

and compromises had no part in his make-up; and he expressed his opinions about persons and things with complete honesty and without hesitation. To the world he sometimes appeared aloof and on occasion cynical; but the cloak covered a nature that was essentially shy and modest and a heart that was fundamentally affectionate, fatherly, and intensely loyal. With all his intellectual ability and profound philosophy he was one of the simplest and kindest of men.

The evening of his life was spent in retirement; the years were taking their toll in the form of circulatory troubles, deafness, and frailty, but the mind remained alert. His happiest year, he said, was his 80th. In that year, with Alan Woods and Weve, he opened the Institute of Ophthalmology in London; thereby he saw his dreams come true with the prospect of the continuance of ophthalmologic research in Britain. In the same year he was presented with his portrait by his colleagues as represented by the Ophthalmological Society of the United Kingdom and the Faculty of Ophthalmologists; thereby he knew that he was not only respected but loved, that all he had given to ophthalmology, and particularly to British ophthalmology, had not been wholly in vain.

Stewart Duke-Elder.

* * *

The death of Sir John Parsons, one of the world's great scientists and ophthalmologists, truly diminishes us. American ophthalmologists are grateful to him for his helpful contributions and will ever revere his memory. A diminishing few of the moderns among us knew him personally, but those of us who did will recall his learned acumen, scientific integrity, and hard head but warm heart. Many of our younger ophthalmologists, stationed in the United Kingdom during the late war, will remember his presence and his learned discussions at the meetings held during that time in London. Some few of us got to know, love, and

respect him through more intimate contact on joint defense boards and allied committees where we leaned on his advice and recommendations and appreciated his worth when he acted as chairman. There was no nonsense about Sir John and you always knew where he stood and often where you did with him yourself.

His *Pathology of the Eye*, published in four volumes in 1904, was the first monograph of the subject written in any language, and if you look carefully you can imagine how it stimulated his favorite disciple, Duke-Elder, to write his famous textbooks. It still is readable, important, and in demand as evidenced by its premium price on the market.

His book, *An Introduction to the Theory of Perception*, published in 1927, is a classic. It is tough reading, so difficult in fact that it provoked F. H. Verhoeff at the time (1936) when he presented the Howe Medal of the American Ophthalmological Society to Sir John, to say jokingly that "this book could only be understood by God and Sir John" and that he thought that "there must be places in it that even Sir John didn't understand." This statement was probably Verhoeff's return for an earlier remark of Sir John that when Verhoeff had toured Great Britain and the Continent at the turn of the century, he "left a trail of bloody heads behind him."

In 1952, I wrote Sir John asking him to write his reminiscences for *THE JOURNAL*. The following characteristic reply was received: "Very many thanks but I shall not avail myself of your kind offer. I am really 'out of it' and 'on the shelf.' It has been a joy to me to have done something to get the ball rolling—but it is now rolling so fast that I can't keep up with it—and I must leave that to more agile limbs! Anyhow, there seem to be plenty of them about, if anything perhaps a little more ballast is needed.

"I am rather afraid to embark on remin-

iscences! I'm too prone to call a spade a spade and that is not always wise or kind! I find myself talking all sorts of scandal when I start reminiscing—just like an old woman! I doubt if it is much good raking over the past. So far as I can see nobody learns any lessons from history. So far as ophthalmology is concerned, the future rests with a few people who are not out for réclame but to advance the science. Good luck to you in the quest."

It is too bad that Sir John did not write his reminiscences for us for he lived in a great period in ophthalmology of which he was one of the chiefs and we would cherish his spade-calling very much indeed.

He was a good man and we mourn our loss internationally.

Derrick Vail.

CORRESPONDENCE

INCISION IN PTERYGIUM OPERATION

Editor,

American Journal of Ophthalmology:

Referring to my article on "Recurrent pterygium" in the August, 1957, issue of *THE JOURNAL*, I now find that a limbus incision two thirds through this area and extending slightly beyond the site of the pterygium above and below seems to give as good results as the incision into the anterior chamber, as originally described. This incision is made with a Bard-Parker knife in the same manner as the groove in cataract surgery. This eliminates all hazard and can be used routinely in every pterygium case whether primary or recurrent.

I mention this change since some of my friends are somewhat afraid of opening the anterior chamber in such cases. Also, this modification makes the operation an office procedure if the surgeon desires. The incision is the final step in whatever kind of operation the surgeon prefers.

(Signed) F. H. Newton,
Dallas, Texas.

BOOK REVIEWS

TRAITEMENT CHIRURGICAL DES AFFECTIONS OCULAIRES. By L. Guillaumat, L. Pau-fique, R. De Saint-Martin, S. Schiff-Wertheimer, and G. P. Sourdille. Paris, G. Doin et Cie, 1957. 419 pages, 105 illustrations, and index. Price: Not listed.

The well-known French authors say in their preface that they "do not propose to write a book on surgical technique . . . our aim is different: We wish to define the operative indications and only to present surgical intervention in the cadre of the therapeutics of ocular diseases themselves. We will only retain those techniques that appear to us to be the best ones. We will accord a very large place to the incidents and operative complications, to their prevention and treatment." This aim is most refreshing and highly successful.

Each chapter, prepared by one of the collaborators, has been carefully reviewed by all of them and personal preferences were excluded.

The present volume consists of chapters on general surgical considerations (for example, instrumentation, equipment, the preparation of the patient, anesthesia, akinesia, hemostasis, and so forth), cataracts, glaucoma, iridocyclitis, and ocular injuries.

The line drawings are excellent and easily followed, even if one's French is below par. The techniques exposed are modern, universal, and beyond cavil. It is a pleasure to follow the arguments presented by these famous ophthalmic surgeons, acting in unison.

Volume II will contain chapters on strabismus, lids and lacrimal apparatus, orbit, ocular tumors, keratoplasty, detachment of the retina, plastic surgery, and prosthetics. We speed the day.

Derrick Vail.

LENS MATERIALS IN THE PREVENTION OF EYE INJURIES. By Arthur Hail Keeney,

M.D., D.Sc. Springfield, Ill., Charles C Thomas, 1957. 73 pages, 19 illustrations, bibliography and index. Price: \$3.50.

This well-documented monograph is replete with factual information and historic details. A crude type of laminated glass was introduced by J. C. Wood of England in 1905. By 1946 polyvinyl butyral became accepted as the most durable interlayer. Case-hardening of lenses must be done after surfacing, polishing, and edging are completed. The lens is heated to just below its softening point and then both surfaces are rapidly cooled by blasts of cold air. These safety lenses are kept at a minimal thickness of three mm. Their principal drawback is the thick appearance and heavy weight. Such tempered lenses are advised for hazardous occupations, vigorous sports, and high minus cylinder corrections in children. Even the hardest plastic material is still softer than glass. Lenses processed from allyl diglycol carbonate, however, have excellent optical characteristics and extremely high safety values. In comparison with glass, this plastic lens has less weight, less tendency to fog, pits less on exposure to welder's spatter, and displays a greater resistance to chemicals.

The material in this monograph was primarily prepared as a thesis for the American Ophthalmological Society and hence will appear in the *Transactions* of the society. This fine brochure is a worthy addition to the American Lectures in Ophthalmology edited by Dr. Donald J. Lyle.

James E. Lebensohn.

CORTISONE IN OPHTHALMOLOGY. By Antonio Ros. Mexico. D.F., Libreria Zaplana, 1952. 191 pages, bibliography. Price: 20 pesos.

This monograph is a clear, detailed, and comprehensive review of the subject. It covers all phases of our knowledge in this field and is well planned. In the first 70 pages a conscientious presentation is made of the known facts about the hormones and the

glands which produce them. The histology of the hypophysis and physiologic properties of its extracts, the anatomy, histology, embryology, and physiology of the adrenal glands are reviewed briefly. The next 40 pages are devoted to a thorough discussion of ACTH and cortisone with its derivatives. The biochemistry, physiologic function, effect on organs, tissues, and glands, action in anaphylaxis and allergy, and the prevention of undesirable effects of these agents are presented concisely. The final section of the monograph takes up in detail the clinical application of these agents in ocular diseases. While some of the author's conclusions may be considered controversial, the 231 references to the literature make the monograph a worthwhile addition to the library of Spanish-reading ophthalmologists.

Ray K. Daily.

ACCOMMODATION AND BINOCULAR VISION. By Priv.-Doz. Dr. Robert Siebeck. Halle (Salle), Veb Carl Marhold, 1957. 100 pages, paper-bound. Price: D.M. 26.25.

The exhaustive bibliography and the detailed presentation testify to the author's profound knowledge of his subject. His experiments confirm those of Hess in showing that a difference in the accommodation of the two eyes cannot be experimentally induced. However, his objective measurements of accommodation do show in certain clinical cases a lessened accommodation in the affected eye: in monocular myopia, monocular amaurosis due to optic atrophy, and divergent and convergent strabismus.

James E. Lebensohn.

THE STORY OF PEPTIC ULCER. By Richard D. Tonkin, M.D., F.R.C.P. London. Philadelphia, W. B. Saunders Company, 1957. 71 pages. Price: Not listed.

This tiny brochure, cast in the format of a child's picture book, is a serio-comic essay concocted presumably for the edification and encouragement of ulcer victims of a limited

variety under the care of the author or of colleagues on either side of the Atlantic. The comic aspects are furnished or reinforced by numerous sketches of cartoon-type, or caricatures, by Raymond Hellier.

Type faces are large, and the text is spread thinly over the pages, so that the whole can be perused, even though not fully digested, by the casual reader in less than half an hour.

Part I, about half, is concerned with etiology, including some statistics, with the quite proper conclusion that, despite what is known, there are factors of mystery in this subject which await final solution.

Part II concerns management and, since the question of surgery is by-passed or ignored entirely, it should be a fair assumption that the book is intended only for patients with the variety of peptic ulcer which is amenable to medical management. Those with a severe form of the disease, or with complications requiring surgery, would also require a larger book.

Flexibility and tolerance may be said to characterize the author's plan of medical management, which is thus at variance with the once famous "sippy method." The general plan is supplemented by a limited amount of detail on dietary and other factors. Additional comments could be made but the review should not be longer than the book. At any rate, the author has produced a witty essay containing some wise philosophy, and the illustrator rates something more than honorable mention.

William F. Moncreiff.

HEADACHE: DIAGNOSIS AND TREATMENT.

By Robert E. Ryan. St. Louis, C. V. Mosby Company, 1957, edition 2. 407 pages and index. Price: \$6.75.

Headache, a perennial problem to the ophthalmologist, is well covered in this monograph by Ryan, now in its second edition. New chapters have been added on the tranquilizers, histamine, temporomandibular joint syndrome, and facial neuralgia. The influence of Horton is evidenced by the emphasis on the histamine headache and its treatment.

While but a small percentage of headaches can be blamed on an ocular origin the ophthalmologist is frequently the first physician to be consulted by the patient suffering from this common symptom and he should therefore be in a position to advise the patient as to possible causes after eliminating the eye as the source of trouble. This book will do much to increase his understanding of the subject and it is therefore recommended to the practising ophthalmologist.

The chapter on ophthalmologic head pain is written by Leslie C. Drews, who has covered the subject well and presented judicious advice as to "eyestrain headaches" as well as those caused by glaucoma, migraine, and various ocular diseases. Certainly the internist or general practitioner reading this chapter will develop a more realistic idea of the role of the eye in the production of headache than he is likely to have had up to that time.

William A. Mann.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. Anatomy, embryology, and comparative ophthalmology | 10. Crystalline lens |
| 2. General pathology, bacteriology, immunology | 11. Retina and vitreous |
| 3. Vegetative physiology, biochemistry, pharmacology, toxicology | 12. Optic nerve and chiasm |
| 4. Physiologic optics, refraction, color vision | 13. Neuro-ophthalmology |
| 5. Diagnosis and therapy | 14. Eyeball, orbit, sinuses |
| 6. Ocular motility | 15. Eyelids, lacrimal apparatus |
| 7. Conjunctiva, cornea, sclera | 16. Tumors |
| 8. Uvea, sympathetic disease, aqueous | 17. Injuries |
| 9. Glaucoma and ocular tension | 18. Systemic disease and parasites |
| | 19. Congenital deformities, heredity |
| | 20. Hygiene, sociology, education, and history |

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Papamiltiades, M. **The communication between the anterior chamber and the lymphatics of the conjunctiva in man.** *Ann. d'ocul.* 189:939-945, Nov., 1956.

The authors believe that in addition to the canal of Schlemm there are conjunctival avenues of escape for aqueous from the anterior chamber. To prove this they injected the "Gerota-Rouviere" mass into the anterior chambers of 20 newborn infants, two adults and several domestic animals. The material could be seen in the episcleral veins almost immediately but only in two cases were the lymphatics of the conjunctiva injected. These two positive results indicate to the authors that there is a connection between the anterior chamber and the lymphatic net of the conjunctiva draining into the parotid nodes. (1 figure, 31 references)

David Shoch.

Pau, H. and Stochdorph, O. **The limitans of the vitreous as modified brain covering.** *Arch. f. Ophth.* 159:159-161, 1957.

The vitreous can be looked upon as a covering membrane of a cerebral structure on the basis of the embryological consideration of its function of covering a cerebral tissue (the retina) but also in view of its structure. The supporting tissue of the vitreous is essentially a vestige of former embryonal vessels and its hyaluronic acid content is high. The limitans interna and its cells may be considered an organspecific modification of the covering membranes of the brain. (2 figures, 6 references) F. H. Haessler.

Rohen, Johannes. **Division of ciliary body into two morphologically and functionally different portions.** *Ophthalmologica* 133:103-109, Feb., 1957.

In rodents, carnivores and some primates the anterior portions of the ciliary processes differ from their posterior portions by a closer relationship between the pigmented epithelium, on the one hand, and the capillaries and stroma cells, on the other. Besides, the anterior portions respond much more strongly to stimuli such as anterior chamber puncture. The opinion is expressed that only the anterior portions are concerned with the elaboration

of aqueous and that the posterior portion is more directly engaged in the process of accommodation. (5 figures, 10 references)

Peter C. Kronfeld.

Van den Heuvel, J. E. A. **The behavior of surviving lens epithelium in vitro.** *Ophthalmologica* 133:447-451, June, 1957.

This is a preliminary report on the survival rate and the histologic characteristics of bovine lens epithelium under tissue culture conditions. (3 figures, 3 references)

Peter C. Kronfeld.

Van den Heuvel, J. E. A. **The development of the cell nuclei in the lens.** *Ophthalmologica* 133:440-447, June, 1957.

In the process of the formation of lens fibers the nuclei undergo fairly characteristic changes which the author has studied systematically in normal, bovine and human, lenses as well as in human cataracts. (8 figures, 8 references)

Peter C. Kronfeld.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

DeRooy, A. J. P. M. **The choice of antibiotic in external bacterial infections of the eye.** *Ophthalmologica* 133:434-439, June, 1957.

A modification of the conventional test for specific antibiotic sensitivity is described. "Difco's" heart infusion agar mixed with defibrinated blood is poured into Petri dishes aiming at layers of uniform thickness. The surface of the medium is evenly inoculated with the micro-organism cultured from the eyelids, conjunctiva or cornea. Small cylindric holes are punched in the culture medium with a sterile cork punch. These holes are then filled with ophthalmic ointments containing various antibiotics. Sensitivity tests done in this manner approximate closely the mode of contact between microorgan-

isms and antiinfective agent in the conjunctival sac. (4 figures)

Peter C. Kronfeld.

Halbert, S. P., Locatcher-Khoraso, D., Sonn-Kazar, C. and Swick, L. **Further studies on the incidence of antibiotic-producing micro-organisms of the ocular flora.** *A.M.A. Arch. Ophth.* 58:66-76, July, 1957.

Antibiotic production was found in 47 percent of ocular bacterial strains tested against *corynebacterium pseudodiphtheriticum*. These strains apparently do not protect the carrier from conjunctivitis. (6 figures, 3 tables, 31 references)

G. S. Tyner.

Necdet, Sezor. **Preliminary report on the culture of the trachoma virus.** *Bull. et mém. Soc. franç. d'opht.* 69:498-505, May, 1956.

The studies of the etiology of trachoma go back as far as 1950 when the continuous inoculation of trachoma virus on the chorio-allantoid membrane and the yolk-sack of chickens was started and the growth on tissue culture was initiated. The material and methods used are described as well as the gross and microscopic appearance of the cultures. The pathogenic agent was inoculated into mice and rabbits and a few human volunteers, who developed a mild, mostly self-limited conjunctivitis. The tissues used were corneas, lungs and liver-cells of embryos. The adaptation of the virus to human epithelial cells could not be fully evaluated but the study will be continued.

Alice R. Deutsch.

Schwab, F. **The concentration of antibodies in the cornea under different conditions.** *Arch. f. Ophth.* 159:1-44, 1957.

The author studied the problem whether local administration of cortisone or hyaluronidase or exposure to X rays would affect the amount of antibody when

suspensions of typhoid bacilli or solutions of bovine albumen were injected into the cornea. Sixty rabbits were used and it was found that cortisone definitely diminishes the formation of antibodies, hyaluronidase produces an insignificant diminution of corneal agglutinins and precipitins, and that corneas exposed to X rays showed larger amounts of antibody than the control eyes. (10 figures, 2 tables, 82 references)

Ernst Schmerl.

Witmer, R. **The antistreptolysin-O-test in uveitis.** *Ophthalmologica* 133: 320-325, April-May, 1957.

Antistreptolysin is an antibody formed in response to the liberation within the body of streptococcal exotoxins, specifically streptolysin-O. The presence of the antibody in the patient's blood can be demonstrated and its amount estimated by a fairly simple test.

The test was done on four groups of patients, viz. 1. cases of acute uveitis, 2. cases of chronic uveitis, choroiditis or optic neuritis, 3. a control group of eye patients free from inflammatory disease, and 4. another control group consisting of cases of definite streptococcal systemic diseases. Groups 4 and 1 had the highest percentage of positive tests and the highest average antistreptolysin titer. A positive antistreptolysin test may be of etiologic significance. (4 tables, 6 references)

Peter C. Kronfeld.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Barraquer, J. and Canadell, J. **The exophthalmogenic factor of the serum.** *Ann. d'ocul.* 189:856-866, Oct., 1956.

Following the lead of American endocrinologists who demonstrated a proptosis in certain fish after injection of hypophyseal extracts, the authors searched for a fish native to France that would

make the same response. They found that *Carassius auratus* responded with an exophthalmos after injection of small doses of hypophyseal extract or of the serum of hyperthyroid patients. They report about 15 cases of hyperthyroidism and its variants in which the diagnosis was established or verified by repeated injections of serum extracts into *C. auratus*. A positive result is protrusion of the fish's eyes after the fourth injection. The authors feel that the exophthalmogenic factor of the serum is probably the same as the thyrotropic hormone of the pituitary. (8 figures, 5 references)

David Shoch.

Borfschein, H. and Schubert, G. **"Baseline potential" (the potential at rest) and state of accommodation of the human eye.** *Arch. f. Ophth.* 159:45-51, 1957.

In a former study one of the authors (G. S.) had shown that accommodation potentials obtained from scleral leads were probably potentials produced by the ciliary muscle. The present investigation, performed in three normal persons, reaffirmed the finding and interpretation. Methods and instrumentation are described. (2 figures, 1 table, 12 references)

Ernst Schmerl.

Cagianut, M. and B. **The proteins of human lenses.** *Ophthalmologica* 133:301, April-May, 1957.

The amino acid components of the lens proteins were determined quantitatively by paper chromatography. The only difference between nucleus and cortex found in one normal lens was a higher lysin content in the latter. The amino acid composition in the nucleus of a nuclear cataract differed significantly from that in a clear lens nucleus.

Peter C. Kronfeld.

Dische, Z. **Physiological chemistry of the eye.** *A.M.A. Arch. Ophth.* 58:562-604, Oct., 1957.

This is an excellent review on this phase of ophthalmology. (135 references)

G. S. Tyner.

François, J. and Rabaey, M. **On the existence of an embryonic lens protein.** *Ann. d'ocul.* 189:836-854, Oct., 1956.

Soluble lens proteins have classically been divided into three types: alpha, beta and gamma crystalline. The latter is present in very small concentration and not demonstrable electrophoretically. However, the authors have demonstrated three components by paper electrophoresis, all present in reasonably high concentration. It had previously been thought that the third component was a denaturation product of alpha crystalline appearing in the course of the aging of the lens. The authors demonstrate that this is not true but that it is a distinct protein formed only in the early stages of the development of the lens. The concentration of this Fraction III increases very little after birth in contrast to Fractions I and II which continue to increase progressively. (19 figures, 4 tables, 16 references)

David Shoch.

Girardet, P. and Jeanneret, O. **Acute psychosis in a 13-year-old boy following the topical administration of homatropine.** *Ophthalmologica* 133:229-301, April-May, 1957.

After topical administration of atropine and homatropine on several previous occasions had caused no noticeable side-effects, two drops of 1 percent homatropine hydrobromide were ordered to be given four times during the 24 hours preceding the refraction test. After the second (evening) dose the boy went to sleep, but had nightmares, got out of his bed and walked through the house without waking up. After the third (morning) dose of homatropine he lapsed into an acute psychosis characterized by complete disorientation, hallucinations, logorrhea and

motor agitation. With sedatives and pilocarpine subcutaneously the psychosis cleared within 48 hours. The homatropine solution was tested and found to be correct as to composition and strength.

The authors attribute the incident to a state of hypersensibility due to "constitutional and psychosomatic factors." (9 references) Peter C. Kronfeld.

Green, H. and Solomon, S. A. **The effect of age upon lens metabolism.** *A.M.A. Arch. Ophth.* 58:23-36, July, 1957.

Using young and old rabbits as experimental animals, certain studies were carried out on their extracted lenses. The older lenses were higher in weight, contained 10 percent less water, and 0.6 percent more protein. The enzyme systems were similar in both age groups, although the younger lenses showed greater metabolic efficiency. In general, these findings are in agreement with the present concept of lens changes with age. (4 tables, 6 figures, 18 references)

G. S. Tyner.

Heydenreich, Andreas. **The morphologic and microchemical behavior of the pigment granules of the eye.** *Arch. f. Ophth.* 159:162-179, 1957.

The pigmented structures of the eyes of various animals (in particular the bovine eye) have a specific granular pigment which can be shown to consist not only of fuchsin and melanin but a specific pattern of several of a number of different melanins. It was also found that the granules are extraordinarily resistant to chemical, physical and autolytic agents. (7 figures, 24 references)

F. H. Haessler.

Koike, K. **Studies on drug maintenance in ocular tissues following topical application.** *Acta Soc. Ophth. Japan* 61:723-737, June, 1957.

The penetration of antibiotics into the

anterior chamber is greatest when they are applied in the form of an ointment. An increase in the application frequency is necessary to obtain the same penetration when applied in the form of oil suspension or water solution. An antibiotic with a greater phase solubility penetrates through the cornea easier than one with a lower phase solubility. A smaller molecular weight itself does not necessarily indicate an easier penetration. The addition of a wetting agent considerably enhances the penetration. An increase in the application frequency and in the concentration of an antibiotic have nearly the same effect on the increase of penetration. Antibiotics traverse the rabbit cornea in 40 to 80 times greater quantity than the human cornea. (11 figures, 7 tables, 59 references)

Yukihiko Mitsui.

Kurose, T. **A study of outflow pressure.** *Acta Soc. Ophth. Japan* 61:839-843, July, 1957.

India ink was injected under pressure into the anterior chambers of rabbits. The pressure of the cervical vein was controlled by connecting the vein to a manometer. The ink appeared in the anterior ciliary vein when the pressure difference between the anterior chamber and the cervical vein became greater than 6.4 mm. Hg. (2 tables, 23 references)

Yukihiko Mitsui.

Levene, Ralph Z. **Studies on ocular blood flow in the rabbit.** *A.M.A. Arch. Ophth.* 58:19-22, July, 1957.

By employing Sapirstein's fractionation technique, ocular blood flow in rabbits was determined as 46 percent of cerebral blood flow. Paracenteresis increased the ocular blood flow by 90 percent. (2 tables, 11 references)

G. S. Tyner.

Linnér, E. and Prijot, E. **Preganglionic cervical sympathectomy and aqueous flow.** *A.M.A. Arch. Ophth.* 58:77-78, July, 1957.

Preganglionic cervical sympathectomy in rabbits had no effect on intraocular pressure or facility of aqueous outflow. (2 tables, 8 references)

G. S. Tyner.

Matumoto, K. **Metabolism of the cornea in experimental corneal vascularization.** *Acta Soc. Ophth. Japan* 61:1062-1071, Aug., 1957.

This study was suggested by the occurrence in Japan of much nontrachomatous pannus which is clinically similar to that of trachoma. The condition had been ascribed to a vitamin B₂ deficiency. Matumoto produced a similar pannus by injecting alloxan into rabbit cornea and compared this condition with an experimental deficiency pannus.

When a solution of alloxan was injected into rabbit cornea, a corneal vascularization began to appear in three to five days. When measured by the Warburg method, the oxygen consumption and aerobic glycolysis of the cornea decreased during a few days after the injection. They began to increase, however, with the beginning of the corneal vascularization. A deficiency in vitamin B₂ also produced corneal vascularization with similar changes in the corneal metabolism: namely, an initial decrease and a late increase, though it took two months until the corneal vascularization with metabolism increase began to appear. (2 figures, 15 tables, 30 references)

Yukihiko Mitsui.

Minura, S. **An experimental study of methanol intoxication of the eye.** *Acta Soc. Ophth. Japan* 61:862-883, July, 1957.

Methanol was given to rabbits. The regeneration of rhodopsin was definitely impeded. A definite decrease in the tissue respiration and aerobic glycolysis, as shown by Warburg's procedure also resulted. Formaldehyde, a metabolic derivative of methanol, showed the greatest influence. (14 figures, 10 tables, 71 references)

Yukihiko Mitsui.

Mitarai, G. and Sugita, Y. **Effect of ATP on the cone action potential.** *Acta Soc. Opth. Japan* 61:1325-1332, Aug., 1957.

The cone potential was recorded by an ultramicro-electrode in an "inverted retina" of carp. When the retina was dipped in 1/100 mol ATP-Ringer solution, the amplitude of the potential vibration by a light stimulus was increased and the vibration became rapid. A considerable decrease in the potential was observed when the retina was dipped in a solution of moniodine acetate. The authors conclude that ATP activates the cone function. (9 figures, 15 references)

Yukihiko Mitsui.

Ohashi, Kohei. **Uveoretinal blood pressure ratios.** *Ophthalmologica* 133:23-36, Jan., 1957.

Previous ophthalmodynamometric studies have concerned themselves principally with the relationship (ratio) between retinal and brachial arterial blood pressure levels. The author of the paper under review has extended these studies to include measurements on ciliary arteries and veins as well as on vortex veins, in Japanese subjects with normal and diseased eyes. Average values for uveoretinal bloodpressure ratios as determined by the author, were 1.15 for the systolic arterial and 1.00 for the diastolic arterial blood pressure. These ratios were also determined after compression of the globe and under the influence of drugs. The evaluation of the results is made difficult for the American reader by a large number of ambiguous or unclear passages in the English text. (1 figure, 11 tables, 18 references)

Peter C. Kronfeld.

Pabst, W. and Heck, J. **Course of recovery of the electroretinogram following intraocular ischemia and hypoglycemia.** *Arch. f. Opth.* 159:52-59, 1957.

The authors studied the recovery period of the retina in rabbits. They produced an

ischemia by increasing the intraocular pressure up to 200 mm. Hg and in some of the animals they also lowered the blood sugar level considerably. In the latter group of animals recovery of the b-wave of the electroretinogram recurred not more than 30 minutes after the production of the ischemia. Without hypoglycemia recovery was found 60 to 70 minutes after the onset of the ischemia. The authors feel that therapeutically additional administration of glucose might be helpful where an acute retinal disturbance presents itself. (6 figures, 17 references)

Ernst Schmerl.

Palich-Szanto, O. **The miotic Ortho.** *Ophthalmologica* 133:414-418, June, 1957.

The Hungarian preparation Ortho is identical with the phosphoric acid ester of diethyl-p-nitrophenol manufactured and marketed by Bayer under the name of Mintacol. In 1 to 6,000 aqueous solution, applied 5 or 6 times every 30 minutes, the drug is capable of overcoming the effect of atrophine. (11 references)

Peter C. Kronfeld.

Pommer, H. **Iontophoretic transfer of iodide across the cornea.** *Ophthalmologica* 133:145-153, March, 1957.

The iodide concentration in the anterior aqueous of rabbits was determined 15 minutes to six hours after iontophoretic administration of an iodide solution containing a small percentage of radioactive iodine. The duration of the application was four minutes. The intensity of the current was varied from 0.3 to 1.0 mA. Radiometric iodide determinations were made on aspirated 0.1 ml. samples of aqueous.

Peak levels were reached after about 30 minutes. Stronger currents produced higher peak levels and a more rapid decay than weaker currents.

Although the cornea was not touched by any part of the active electrode, defi-

nite traumatic effects in the form of erosions or stippling of the corneal surface were observed. The severity of these changes was related to the intensity of the current.

The more rapid disappearance of iodide after application of the stronger currents is an interesting and as yet unexplained phenomenon. (3 figures, 1 table, 9 references)

Peter C. Kronfeld.

Sasaki, T. **Effect of stress on retinal metabolism.** *Acta Soc. Ophth. Japan* 61: 1253-1265, Aug., 1957.

Three hours after acute stress, a surgery without anesthesia, there is a considerable reduction in oxygen consumption and aerobic glycolysis of rabbit retina as shown by Warburg's method; 24 hours later there is a considerable increase in the metabolism. The metabolism returns to the normal level 48 hours after the stress. (1 figure, 4 tables, 113 references)

Yukihiko Mitsui.

Schweer, G. and Pook, W. H. **The glucosamine of the vitreous body of beef. Comparative determinations of the protein concentration in the vitreous.** VI. *Arch. f. Ophth.* 159:112-116, 1957.

This paper is a continuation of former studies by Schweer. Vitreous protein was determined by the use of the biuret reaction according to Ditterbrandt-Weichselbaum. The protein concentration in calves was found to be 42.5 mg. percent and about 5 percent higher than in older animals. The protein concentration of the anterior vitreous seems to be slightly lower than that of the posterior part. The formerly found differences of glucosamine depending on age of the animal and site in the vitreous body do not seem to be due to differences of the protein glucosamines but to differences in the concentration of the hyaluronic acid glucosamines found under these conditions. (3 tables, 6 references)

Ernst Schmerl.

Sobanski, J., Swietliczko, I. and Szosland, M. **Formation and elimination of the aqueous: new methods of measurement.** *Ophthalmologica* 133:81-102, Feb., 1957.

The authors' principal investigative tool is Sobanski's ophthalmodynamometer (a modification of Bailliar's) which is applied to the eyeball either in the conventional manner, that is to the anterior sclera between two rectus muscles radially to the globe, or to the circumcorneal region by means of a ring-shaped attachment. The latter form of application aims at the compression of the anterior outflow channels and is, therefore, called "ring-block-pressure." The conventional form of application is called "side-pressure."

From five basic experiments in which the form of application and the amounts of pressure were varied, the conclusions are drawn that the canal of Schlemm-aqueous vein system is the only significant outlet for aqueous and that the rate of aqueous formation is critically dependant upon the pressure in the intraocular arteries. Also, on the basis of these five basic experiments, the authors recommend a combination of two tests to determine the capacity of the ciliary body to form aqueous and the facility of aqueous outflow. The combined test consists of the following steps: 1. tonometry (R_1), 2. measurement of the systolic and diastolic arterial retinal pressure by dynamometry, 3. repeated brief tonometries until the original ocular tension level (R_1) is reached again, 4. ring-block-pressure raising the ocular tension to the level of the previously determined diastolic arterial pressure for four minutes, and 5. tonometry (R_2).

In normal eyes R_2 in mm. Hg is from 15 to 50 percent higher than R_1 . Since the outflow channels are blocked by the ring-shaped attachment to the dynamometer, the rise in pressure from R_1 to R_2 is a measure of the amount of aqueous produced during the four-minute test period.

The second part of the test is done a

few minutes after the first one. It consists of an initial tonometric reading, then the application of side-pressure corresponding in amount to the previously (under 2) determined systolic arterial pressure and a final tonometric reading which (in mm. Hg) should be 15 to 15 percent smaller than the initial reading. This difference may be considered a measure of the facility of aqueous outflow. It has been found characteristically low in chronic simple glaucoma. (14 figures, 1 table, 7 references)

Peter C. Kronfeld.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Cuppers, C. and Sevrin, G. **The fixation problem in amblyopia, especially in nystagmus.** Bull. et mém. Soc. franç. d'opht. 69:359-366, May, 1956.

Patients with pronounced nystagmus mostly have a bilateral amblyopia and their ocular movements are without coordination, demonstrating the close relationship between nystagmus, ability of fixation and visual acuity. The promotion of fixation seems to be an essential factor in improvement of amblyopia. Actual objects appear to have a continuous motion when seen by patients with nystagmus, but after-images appear to be steady. The incitement of after-images provides a stable fixation point in space for persons who never before could be given one. By centering the patient's attention on this after-image it is possible to develop fixation followed by secondary treatment of the amblyopia.

In spite of the many technical difficulties such as the provocation of an after-image by exact stimulation of the macula in oscillating eyes and holding the patient's attention on this tedious visual performance, these experiments seem to be an interesting and promising therapeutic endeavor.

Alice R. Deutsch.

Dieterle, P., Gordon, E. and Abt, K. **The standard curve and fiducial limits of dark adaptation obtained with the adaptometer of Goldmann-Weekers.** Ophthalmologica 133:273-277, April-May, 1957.

This is a short abstract of a thesis with the same title by E. Gordon (Genève 1956). Dark-adaptation curves were determined in 20 normal individuals under the following conditions: exposure to subdued light for 15 minutes, then to 2,000 lux for five minutes, monocular determinations of the light threshold under the influence of a mydriatic. A standard curve was constructed on the basis of the geometric means. (1 figure)

Peter C. Kronfeld.

Fankhauser, F. and Schmidt, T. **Scotopic visual functions studied with the adaptometer of Goldmann-Weekers.** Ophthalmologica 133:264-272, April-May, 1957.

On 80 individuals with normal eyes, three characteristics of scotopic vision were determined: 1. the absolute light threshold, 2. the threshold for elementary form or contrast perception (recognition of the Landolt ring as a ring), and 3. the scotopic visual acuity (recognition of the position of the break in the ring). After constant values for the above characteristics were reached, additional tests for contrast perception and acuity were done. Then a three-minute period of light adaptation of 2,400 lux was interposed and followed by tracings of the visual acuity at constant low light intensity with Comberg's nuctometer. All measurements were made binocularly. In this manner, standard curves for four different age groups were determined. Division of these examinees into four age groups resulted in a spread, within each group, of less than ± 3 sigma and a very sharp turning point (point alpha) in the adaptation curves. The rise in sensitivity from

alpha to the end point is considered more significant and reliable than the early part of the curve. Comparing the findings in individuals 10 to 20 years of age with those in people 60 to 80 years of age, a very definite age effect upon all thresholds could be demonstrated. (7 figures, 3 references) Peter C. Kronfeld.

Gardiner, P. A. **The diet of growing myopes.** Tr. Ophth. Society U. Kingdom 76:171-180, 1956.

The author studied the diet of the children with hyperopia and myopia and the myopes showed a considerably lower intake of first-class protein compared to the hypermetropes over the age of eight years. (8 figures, 1 table, 3 references) Beulah Cushman.

Giroud, Esther. **Determination of the field of gaze (Blickfeld).** Arch. f. Ophth. 159:66-80, 1957.

The author studied the binocular field of gaze in 32 young normal persons and found it approximately to have a size of 60° in all directions. (6 figures, 9 references) Ernst Schmerl.

Grancini, L. E. and Cenachi, G. **Electroencephalograms in amblyopias, as determined in a group of children of grammar school age.** Bull. et mém. Soc. franç. d'opht. 69:366-378, May, 1956.

Among the pupils at the grammar school in Varèse 14 children were found to have a symmetrical, isometropic amblyopia without squint or intraocular abnormalities. All these children had a complete psychiatric and neurologic examination and an EEG. The registration was made under rest, hyperpnea, with eyes open and eyes closed. The EEG was abnormal in all the 14 children. Four showed signs of immaturity, four of epilepsy and six of encephalopathies without exact localization. In spite of the small number of cases, important and interesting con-

clusions could be made by differentiating amblyopias of ocular and extra-ocular origin. (7 figures, 14 references)

Alice R. Deutsch.

Hayashi, A. **Spectral sensitivity of the central fovea during primary dark adaptation.** Acta Soc. Ophth. Japan 61:760-774, June, 1957.

This is a study of the color sensitivity of the fovea during the early stage of dark adaptation. Three peaks of sensitivity are recognized during this stage corresponding to the wave lengths of 440-460 mμ, 540-560 mμ, and 600 mμ. A preadaptation to a colored light may change the site of these peaks. Sound stimuli may also alter the color sensitivity. In general, by a sound stimulus, the sensitivity to shorter waves increases while that to longer waves decreases. (16 figures, 50 references) Yukihiko Mitsui.

Hong, S. **Types of acquired color-vision defects.** A.M.A. Arch. Ophth. 58:505-509, Oct., 1957.

The author points out the existence of acquired color-vision defects. He believes that it is a mistake to classify these cases under the terminology for congenital color-blindness; rather he recommends classifying them into the retinal type and the neural type, depending on the luminosity curve, the Rayleigh equation, and Grassmann's third law. (9 figures, 2 tables, 8 references) G. S. Tyner.

de Jaeger, A. and Bernolet, J. **Amblyopia ex anopsia and its treatment by pointing.** Bull. et mém. Soc. franç. d'opht. 69:385-392, May, 1956.

The causes of the so-called amblyopia ex anopsia are either abnormalities in maturation or limitations in the use of the nonfixing eye or a combination of both. The poor use of the eyes in question depends on a passive factor, nonuse, and on an active factor, inhibition. The active

factor can be eliminated by patching the leading eye. The passive factor can be enhanced by training. This system of visual reeducation is described in detail. The authors train children by inducing them to touch the centers of spots on a card with a small pointer under the direction of a technician. In the beginning the children have difficulty getting even near the center of rather large spots. With practice they touch the centers of very small ones precisely. The spots may be placed at random or, to hold the child's interest, in various patterns. This type of training can be applied in various kinds of amblyopia without fundus disease, even in patients with excentric fixation, after foveal fixation has been achieved by Cuppers training methods. Cooperation of the child and his mother are most essential for success in this type of training. (5 references)

Alice R. Deutsch.

Jarry, C. **The visual field after dazzling of the retina in normal subjects.** *Ann. d'ocul.* 189:946-962, Nov., 1956.

The author feels that information can be obtained from visual fields done in a completely light-adapted eye that cannot be learned from the usual field done under conditions of semi-obscurity. He reports that such fields are concentrically constricted; the greater the dazzling the more the constriction. Dilatation of the pupil increases the dazzle and therefore makes the constriction greater. Only the eye subjected to the dazzling shows the effect.

David Shoch.

Lang, J. **The practical significance of anomalous retinal correspondence.** *Ophthalmologica* 133:215-217, April-May, 1957.

The report concerns cases of esotropia with anomalous retinal correspondence which, after surgery, showed a tendency to revert to their original, preoperative, esotropic position, probably under the influence of the deeply ingrained abnor-

mal sensory relationship between the two retinas. (4 references)

Peter C. Kronfeld.

LeGrand, Y. and Baumgardt, E. **Fluorescent illumination and visual fatigue.** *Ann. d'ocul.* 189:829-835, Oct., 1956.

The authors state that there are many more complaints of visual fatigue by people who work by fluorescent light than by those who work under standard "incandescent" illumination. It was felt that the flickering of fluorescent lights run by an alternating current was responsible for the complaints. A standard visual task was presented to 11 subjects and after 15 minutes a test for dazzling or a test for accommodation was presented. Half the group performed their task in fluorescent light fed by alternating current while the other half performed under similar illumination fed by direct current.

There was no difference in dazzling in the two groups but a statistically significant difference in accommodation was found. The authors feel that it is the flicker ratio of the fluorescent lights fed by alternating current that is responsible for the visual complaints. (1 table)

David Shoch.

Mayweg, Sigurm. **Concerning occlusion and other forms of amblyopia treatment.** *Ophthalmologica* 133:218-221, April-May, 1957.

The report concerns itself with some of the less common effects of occlusion. In three children a residual esotropia after surgery (up to 18 degrees) was reduced to almost zero by occlusion. Two of the children were too small for determination of their sensory retinal cooperation.

Included in the report is a rather unique case of malignant melanoma in the good right eye and esotropia, amblyopia and eccentric fixation since birth in the left eye of a 35-year-old female patient. The vision of the right eye had dwindled to

2/60 at the time of the enucleation, the left vision at that time being 1/60 eccentrically. Intensive amblyopia treatment with the euthyscope after Cueurpers was started immediately after the enucleation of the right eye. Within six weeks the visual acuity of the left eye improved to 20/25 on the Snellan number chart and 20/20 on the Snellen illiterate chart. The case demonstrates that severe amblyopia with eccentric fixation is amenable to occlusion of the other eye plus systematic training of the fovea. (6 references)

Peter C. Kronfeld.

Nauheim, Jack Stanley. **A preliminary investigation of the retinal locus as a factor in fusion.** A.M.A. Arch. Ophth. 58:122-125, July, 1957.

These studies suggest that paramacular targets represent a greater stimulus to fusion than do central targets and that retinal locus rather than the area stimulated determines the effectiveness of peripheral fusion. (1 figure, 1 table, 7 references)

G. S. Tyner.

Roelofs, C. O. and Zeeman, W. P. C. **Apparent size and distance in binocular and monocular vision.** Ophthalmologica 133:188-204, March, 1957.

The investigative tool in this study was a set of stereograms containing black rings on a white background. All rings were of the same size, but varied with regard to the degree convergence required for fusion. Besides, each set of stereograms contained some rings visible to only one eye. Under these conditions five entirely unbiased and two possibly biased examinees made judgments regarding the relative size and distance of all objects seen.

Apparent size and distance of the binocularly seen rings showed the expected dependence upon the degree of convergence, the circles requiring a stronger convergence impulse appearing smaller. "It

was more or less a surprise that the apparent size and the apparent distance of the circles seen monocularly for the most part lay between that of the circles seen binocularly." This placement of the monocularly seen object between the binocularly seen rings occurred only if more than one set of binocularly seen rings was offered. In the presence of only one set of binocularly perceived rings an additional ring offered to one eye only appeared slightly smaller than the former. An interesting theory is developed concerning the origin of convergence impulses out of retinal messages. (2 figures, 9 references)

Peter C. Kronfeld.

Roelofs, C. O. **The question of double localization of monocular stimuli under conditions of normal binocular vision.** Ophthalmologica 133:424-430, June, 1957.

Roelofs takes issue with some of the ideas expressed in J. Linschoten's recent thesis "Structural Analysis of depth perception." The two authors disagree particularly regarding the role of convergence impulses in depth perception. Linschoten describes phenomena elicited by stereograms of certain patterns which he interprets as double localization of monocular stimuli under conditions of normal binocular viewing. Roelofs refutes this possibility of double localization and suggests a different interpretation. (5 figures)

Peter C. Kronfeld.

Sachsenweger, R. **An objective test for visual acuity.** Ophthalmologica 133:418-423, June, 1957.

By means of a projector combined with a motor the images of optotypes of varying size are made to describe horizontal pendular movements on a screen placed at the conventional visual acuity test distance. The objective criterion of seeing is the occurrence of an optokinetic nystagmus. The test has the advantage of allowing exact reproduction of the con-

ditions under which the conventional subjective acuity tests are performed. Certain precautions are necessary to keep the examinee from intentionally inhibiting his optokinetic nystagmus. (1 figure, 6 references)

Peter C. Kronfeld.

Sato, K. **The photopic response of the human electro-retinogram.** *Acta Soc. Ophth. Japan* 61:1241-1255, Aug., 1957.

The x-wave of human ERG has its maximum spectral sensitivity at a longer wave length than that of the b-wave. At an earlier stage of dark adaptation, the x-wave increases more rapidly than the b-wave. The relation becomes reversed however, at the later stage of the adaptation. From these results, Sato concludes that the x-wave and the b-wave are a photopic and a scotopic response respectively. (17 figures, 38 references)

Yukihiko Mitsui.

Schubert, G. **Foveal brightness threshold and simultaneous contrast.** *Arch. f. Ophth.* 159:60-65, 1957.

Using a special method the author studied the phenomenon of simultaneous contrast between fovea and perifoveal areas. He found that contrast phenomena depend entirely upon the photopic system. It seems probable that the occurrence of foveal contrast is caused by inhibitory processes in the second neural layer of the retina. (2 figures, 9 references)

Ernst Schmerl.

Sedan, Jean. **After-care of the reeducated amblyope.** *Ann. d'ocul.* 190:553-566, Aug., 1957.

The author feels that unless some sort of stimulation is maintained, a previously amblyopic eye will lose the improvement which was made by occlusion of the healthy eye. Therefore he has designed a series of exercises for children of various ages and for adults which demand careful

use of these previously poor eyes. The exercises consist primarily of excerpts from modern and classic texts—wherein a certain number of typographical errors have been introduced. Various sizes and forms of type are used and in addition various hand-eye exercises are included (such as connecting dots to form a figure). Children respond quickly to the idea of finding errors in type and performing the number and picture games. Illustrations from the author's text are used in the article. (4 figures)

David Shoch.

Sedan, J. **Color discrimination as a useful method in the treatment of severe amblyopias.** *Bull. et mém. Soc. franç. d'opt.* 69:379-384, May, 1956.

This remarkable study directs attention to a paper by J. Salmon "improving vision among the blind," based on the supposition that many practically blind persons have some visual potentialities which are not put into good use but should be trained to the utmost and so become beneficial for the carriers of visual disabilities. Luminosity, contrast in illumination and color discrimination should be investigated and used towards the teaching of visual perceptions. The instrumentarium consists of articles used in daily living but modified to serve the purpose, such as brightly colored combs, dinnerware and linen as well as some fluorescent products and a few special gadgets. The training was done at home under the supervision of relatives. So far five females and three males, 17 to 28 years old, were studied. Their vision amounted to no more than 1/50. A subjective improvement, at least, was found after a certain training period. The results seemed to be empirical and the approach quite unscientific, nevertheless even recognizing the undoubtedly psychic factor, every effort to help these handicapped persons should be more than appreciated.

Alice R. Deutsch.

Thomas, C. **Physiopathologic factors as basal requisites in the treatment of amblyopias.** Bull. et mém. Soc. franç. d'opht. 69:333-342, May, 1956.

Simple functional amblyopias and amblyopias combined either with strabismus or nystagmus can be corrected by various methods. Children, preferably six years old or younger, with foveal fixation provide the simple cases. All they need is occlusion of the good eye followed by simple orthoptics later. In all other cases the constituent elements must be recognized to provide the basis for a successful therapy. Two basic stages are recognized. The first stage, the retino-cortical stage, includes the treatment of excentric fixation and sensory-motor incoordination and inhibition. The second stage, the cortical stage, involves disturbances of visual perceptions and associated abnormalities such as nystagmus and achromatopsia. The methods and remedies for specific cases are described. The accomplishments of Bangerter of Saint-Galle, and Cuppers of Giessen in the successful treatment of amblyopia are especially recognized. (2 figures)

Alice R. Deutsch.

Zanen, J., Meunier, A. and Coppez, P. **Achromatic and chromatic threshold of central vision in specific diseases of the optic nerve.** Bull. et mém. Soc. franç. d'opht. 69:437-450, May, 1956.

After a description of the methods in use, the findings in eight cases of multiple sclerosis, one case of optic neuritis and one case of digitalis intoxication are discussed and interpreted. It is only early in disease of the optic nerve or in periods of regression that the chromatic deficit, unobtainable with customary methods of examination is apparent. The determinations of the chromatic thresholds were as significant as the determination of the photochromatic interval. The importance of adequate studies towards classification of the pathogenesis of acquired and con-

genital dyschromatopsias is emphasized. (7 figures)

Alice R. Deutsch.

5

DIAGNOSIS AND THERAPY

Almeida, A. **Headaches.** Rev. brasil oftal. 16:43-56, March, 1957.

The author enumerates the structures inside the head which are capable of giving the sensation of pain and discusses the processes which give rise to headaches. Vascular headaches, ophthalmic migraine, trigeminal affections and headaches of ocular origin are dealt with briefly. The author feels that the most frequent headache is a neuralgia of the supraorbital nerve. (12 figures)

Walter Mayer.

Belmonte, Nicolas. **New tables for the calculation of the intraocular pressure modified by dynamometric compression.** Arch. Soc. oftal. hispano-am. 17:227-230, March, 1957.

The tables generally used in dynamometry are either those of Bailliart obtained from manometric studies on cats or those of Müller, Brüning and Sohr obtained from manometric studies on fresh cadaver eyes. The author's procedure begins with an initial tonometry with 5.5 and 10 gram weights with a Schiotz tonometer. Leaving the 10 gram weight applied to the cornea a number 1 Müller dynamometer was applied simultaneously, and the ocular tension recorded at intervals of 10 grams of compression until it fell to zero. A concluding tension with the Schiotz tonometer determined the effect of the manipulation on the intraocular pressure. The data are grouped according to the initial tensions. Charting the average initial figures and the average figures found for each degree of compression provided a series of graphs. The final analysis is reserved for a future publication. In general the graphs are closer to those published by Bailliart than to those

published by Müller, Brünning and Sohr.
Ray K. Daily.

Bonizas, A. **Anterior chamber puncture and studies of the aqueous in leprosy.** Bull. et mém. Soc. franç. d'opht. 69:488-497, May, 1956.

This study was undertaken to examine the aqueous in cases of leprosy scleritis, sclerokeratitis, iridocyclitis and post-uveitic cataract; also to evaluate the local effect of hydrocortisone. The patients came from the leprosarium Santa Barbara close to Athens. Amsler's and Verrey's technique of anterior chamber punctures were used. The protein content of the aqueous was found to be extremely high in most cases. It far surpassed the clinical rating of the Tyndall phenomenon on the slitlamp. The dissociation protein-content in relation to the number of cells was remarkable. The number of cells was in general low except in cases of hypopyon iritis. The bacteriologic findings were negative in every case. The therapeutic effect of hydrocortisone was most conspicuous in cases of hypopyon iritis and acute iritis. No effect was seen in chronic cases. The anterior chamber puncture was well tolerated. No adverse reaction was seen and no hyphema occurred. (12 references)
Alice R. Deutsch.

Croll, L. J. and Croll, M. **Florinef-S therapy in external ocular disease.** Monogr. Therapy 2:105-106, May, 1957.

Florinef-S gave good to excellent results in essentially all external ocular diseases. It was of no value when the disease process was behind the ciliary body. It had definite value in the treatment of iritis following cataract surgery and in the treatment of corneal edema following corneal transplantation. (5 references)

Irwin E. Gaynon.

Czerek-Jaguczanska, Halina. **Prothrombin level in the blood of patients treated**

with typhoid vaccine. Klinika Oczna 27: 157-162, 1957.

The level of prothrombin was measured in 13 patients with various ocular diseases before and after intravenous injection of typhoid vaccine. Small doses of vaccine at the beginning of the disease either did not influence the prothrombin level or elevated it slightly. This did not exclude the probability of stimulation of the reticuloendothelial system. Slightly larger repeated doses of vaccine had a tendency to lower the prothrombin level but within normal limits. The author concludes that the prothrombin level does not indicate the effectiveness of typhoid vaccine and treatment with the vaccine does not affect blood clotting. (2 tables, 22 references)

Sylvan Brandon.

Dekking, H. M. **New stereo camera for eye photograph.** Med. & Biol. Illustr. 7:152-157, July, 1957.

The camera is described in detail and several impressive samples of stereophotographs made with it are reproduced.

Irwin Gaynon.

Djahanshahi, P. **An improvement of the speculum of Lindner.** Klin. Monatsbl. f. Augenh. 131:256-257, 1957.

This speculum has two fixed hooks for the preplaced suture. The temporal hook may be in the way when doing the Graefe incision. This hook can be made movable and can so be flipped out of the way during the section. (2 figures)

Frederick C. Blodi.

Doden, Wilhelm. **Comparisons of the effect of various ointments on the normal conjunctival flora.** Klin. Monatsbl. f. Augenh. 131:237-253, 1957.

The effect of these ointments was tested on 915 clinically normal eyes. The bacteriostatic action of the antibiotics was superior to that of most sulfonamides. A 1-percent yellow oxide of mer-

cury ointment had also a quite satisfactory bacteriostatic effect. Ointment base alone usually enhances the bacterial growth in the conjunctival sac.

Oily ointments or ointments without crystals are better tolerated than ointments with large crystals. All ointments were examined microscopically. A crystal size above 50 micron is of definite disadvantage.

Among the sulfonamides a 10 percent Gantrisin with 5 percent Panthenol was especially effective. The author warns against the indiscriminate use of antibiotics. For the treatment of conjunctivitis sulfonamides and antibiotics not used systemically should be preferred.

More than 91 percent of the 915 eyes had a positive culture. The vast majority consisted of *Staphylococcus albus* and *xerosis bacillus* but there were also 6.1 percent *Staphylococcus aureus*, 2.3 percent *pneumococcus* and 0.7 percent *diplobacillus*. (7 figures, 7 tables, 42 references)

Frederick C. Blodi.

François, J. and Verriest, G. **A new instrument for the study of the scotopic visual field.** *Ophthalmologica* 133:45-52, Jan., 1957.

A dim red light mounted in the center of a hollow hemisphere made of transparent plastic serves as point of fixation. The stimulus is provided by a torchlike device which is moved along the outer surface of the plastic dome by the examiner. The size of the stimulus area is changed by a set of diaphragms, its intensity by a set of Tscherning's photometric glasses. (9 figures, 4 references)

Peter C. Kronfeld.

Galvez, J. **Exophthalmometry in experimental animals.** *Ophthalmologica* 133:140-144, Feb., 1957.

A roentgenographic technique is described for the recording of the position of the eyeballs within the orbit in animals

such as the rat and the guinea pig. Soft X rays, short exposures and a very sensitive dental film placed under the animal's chin are used. From such roentgenograms the actual amount of exophthalmus can be obtained by a geometric method worked out by the author. (9 figures, 4 references)

Peter C. Kronfeld.

Gordon, D. H. **9-alpha-fluorohydrocortisone in ophthalmology.** Monogr. Therapy 2:99-104, May, 1957.

Topically applied fluorocortisone is effective in those portions of the eye and adnexa which are visible to the naked eye, that is, the eyelids, conjunctiva, episclera, sclera, cornea, and iris. The drug was effective in acute meibomitis, conjunctivitis, episcleritis, limbal corneal ulcers, and in retention granulomata following strabismus surgery. (5 figures)

Irwin E. Gaynon.

Graham, P. A. and Naylor, E. J. **A photographic method of measuring the angle of squint.** *Brit. J. Ophth.* 41:425-433, July, 1957.

Most precise measurements of the angle of squint are made by means of the major amblyoscope and they may vary widely from those made by observing the corneal reflex. A method is herein described for measuring this deviation by photographic means which gives a permanent record which can easily be compared with later records.

An aircraft camera mounted on an apparatus having a fixation light and rigid chin and forehead rest is used. The fixation light can be moved along a tangent scale in a horizontal plane. The point of this light on the scale must be known accurately; this angle along with other angles of the instrument are applied in a trigonometric equation to give the angle of squint of the eye. The method carries some sources of error in that theoretical

assumptions of optical constants of each eye must be assumed and also because there are natural inaccuracies in using the equipment in practice. (2 figures, 3 tables, 4 references)

Morris Kaplan.

Grom, Edward. **Psychosomatic factors in ophthalmology.** Arch. Soc. oftal. hispano-am. 17:284-316, March, 1957.

Grom urges that every ophthalmologist, as well as every practitioner of medicine, should have a basic training in psychology, in order to be able to identify the personality type of his patients. He believes that this is important in dealing with patients in whose ocular disturbances psychosomatic factors play a part. Ophthalmologists as a rule do not pay adequate attention to this aspect of ocular disease. The effect of psychosomatic factors on the ocular tension, visual acuity and fields in glaucoma, on lesions based on vascular disturbances, such as migraine, retinal hemorrhage and spasm, conjunctival hyperemia and lid edema, strabismus and asthenopia are discussed in detail and illustrated. An innumerable list of stresses can cause eye strain provided the biopsychic makeup of the patient is predisposed to such reactions. The visual organ is particularly vulnerable to stress because it is the perceiving organ of the most important impressions of the external world. Profound disturbances, requiring psychoanalysis or complicated procedures should be referred to the psychiatrist, with the information obtained from the ocular examination. It is the task of the ophthalmologist to determine to what extent the patient's symptoms are caused by organic lesions, and what parts are psychosomatic in origin. Mild cases may be treated by the ophthalmologist. Frequently a discussion and patient listening to the patient's problems, which is a therapeutic procedure in itself, is adequate. If drugs are indicated the sedative pharmacologic arsenal is very

large from which to make a choice. (35 references)

Ray K. Daily.

Guenther, G., Noteboom, E. and Ploetz, C. **A further contribution to the objective determination of visual acuity.** Arch. f. Ophth. 159:180-190, 1957.

The problem has been approached by only a few workers and their reports have appeared during the last 30 years. The authors describe the elaborate equipment, the nystagomovisometer of Zeiss, and provide a mathematical analysis of their results.

A grid whose size can be varied is presented to the patient's eyes and its recognition is documented by the first nystagmoid jerk which it brings forth. (7 figures, 2 tables, 13 references)

F. H. Haessler.

Lester, I. A. **A case of snake-bite treated by specific taipan antivenine.** M. J. Australia 2:389-391, 1957.

The author describes severe myasthenic reactions in a boy bitten by a snake thought to be a taipan. Ptosis, ocular palsies and dilated pupils were present. Recovery was complete after the administration of taipan antivenine.

Ronald Lowe.

Merté, Hans-Jürgen. **A holder for the tonometer during tonography.** Ophthalmologica 133:134-139, Feb., 1957.

The holder designed by Merte consists of a short hollow horizontal and a solid upright aluminum rod. The latter is inserted in a flexible metal strip fastened to the examinee's head by means of a rubber band. The upright has only one degree of freedom, forward and backward. The horizontal arm is made of two hollow tubes, one sliding within the other with minimal friction. The length of the horizontal arm, thereby, adjusts itself to any change in the position of the tonometer. The "distal" end of the horizontal arm

holds the tonometer. Fixation of the tonometer in this manner prevents or markedly reduces the effects of some of the external disturbing influences upon the tonogram. (4 figures)

Peter C. Kronfeld.

von Nordheim, R. W. **A diagram for the graphic recording of corneal lesions.** *Ophthalmologica* 133:465-469, June, 1957.

A diagram consisting of concentric circles plus some radii is available as a transparent glass slide placed inside the corneal microscope during the examination of corneal lesions. The findings may then be recorded on cards bearing the same diagram. In this manner the corneal area involved in the disease process may be quite accurately defined and recorded. (5 figures, 4 references)

Peter C. Kronfeld.

von Nordheim, R. W. **The noose-tightener, an aid in corneo-scleral suturing during cataract extraction.** *Ophthalmologica* 133:461-464, June, 1957.

The noose-tightener is a speculum-like piece of spring that keeps the portion of the preplaced corneo-scleral suture that crosses the incision, safely out of the way of the Graefe knife. The suture advocated is very similar to that described by Bick. (*Am. J. Ophth.* 39:843, 1953). (2 figures, 3 references)

Peter C. Kronfeld.

Richter, Gerhard. **The role of the ointment base in local antibiotic treatment of the eye.** *Klin. Monatsbl. f. Augenh.* 131: 215-236, 1957.

This is an extensive experimental work in which various forms of chloramphenicol ointment were tested in vitro and in vivo against *Staphylococcus aureus*, *B. coli* and *Pseudomonas aeruginosa*.

25 different ointment bases were tested as to their activity on the culture plate and in the conjunctival sac and as to their penetration into the anterior chamber of

rabbits. Chloramphenicol-oil and the anhydrous water-in-oil emulsions proved far superior to the usual vaseline-paraffin bases in external infections. The water miscible and water soluble bases (especially the surface-active oil-in-water emulsions) show the highest degree of penetration into the anterior chamber. Such ointments are superior to any other type of local or systemic administration. Chloramphenicol seems to be best suited for the treatment of severe intraocular infections. (3 tables, 83 references)

Frederick C. Blodi.

Riedl, Sabina. **Six years of experience with tissue therapy.** *Klinika Oczna* 27: 117-120, 1957.

Tissue treatment was used on 368 patients with optic atrophy, retinitis pigmentosa, degenerative and postinflammatory changes in the retina including the macula, opacities of the vitreous and corneal changes. It was also used in scrofulous changes of the cornea and conjunctiva, allergic conditions and glaucoma. Implanted skin was used in only a few cases. Autohemotherapy was used, but replaced by the use of preserved blood. Placental tissue, placental blood, vernix caseosa and extract from aloe plant were used with less effect. Good results were obtained in disease of the cornea, burns of the eyes and degenerative changes in the eyegrounds. (8 references)

Sylvan Brandon.

Sandiford, H. B. C. **General anaesthesia in ophthalmic surgery.** *Brit. J. Anaesth.* 29:319-325, July, 1957.

General anesthesia is used much more than formerly, and is of greatest aid in the treatment of the apprehensive and difficult patient wherein the surgeon can devote his full attention to the surgery. Ocular complications consist of coughing, vomiting, and restlessness. "The fact remains that the surgeons are emphatic that

these complications of general anesthesia have caused little ocular damage provided that corneoscleral sutures have been used at operation. (4 figures, 4 references)

Irwin E. Gaynon.

Saubermann, G. **Broad-spectrum antibiotics in intraocular infections.** *Ophthalmologica* 133:249-254, April-May, 1957.

In antibiotic-treated human eyes with intraocular infections following injuries or globe-opening operations, the author had the opportunity of determining the antibiotic concentrations in aqueous and, in some cases, even in vitreous samples. The present paper deals with intraocular antibiotic levels following the oral or intravenous administration of terramycin or achromycin and following oral, intramuscular, subconjunctival and topical (by eye bath) application of chloromycetin. Effective concentrations in the ocular fluids were reached in every case.

The ratio of enucleations because of intraocular infection to total number of injuries and cataract operations at the University Eye Clinic in Basle (Switzerland) has dropped from almost 5 percent in 1939 to 0.25 percent in 1954. (1 figure, 3 tables)

Peter C. Kronfeld.

Scheie, Harold G. **New scissors for cataract extraction.** *A.M.A. Arch. Ophthalm.* 58:135, July, 1957.

A new scissors is introduced which has the advantages of a heavy shank which does not permit buckling of the blades. A blunt end to the blades prevents penetration of the iris. (1 figure)

G. S. Tyner.

Scheie, H. G. **Width and pigmentation of the angle of the anterior chamber.** *A.M.A. Arch. Ophthalm.* 58:510-512, Oct., 1957.

The author suggests a system of grading the amount of pigmentation in the angle of the anterior chamber. Pigmenta-

tion is graded I to IV. Pigmentary glaucoma is more apt to occur in the more densely pigmented angles. The depth of the chamber angle is also grade I to IV depending upon the amount of angle detail visible with the gonioscope. Eyes with narrow angles (grade III and IV) are liable to acute attacks of glaucoma.

G. S. Tyner.

Tassman, I. S. **Stress in ocular diseases.** *Tr. Am. Acad. Ophthalm.* 61:179-193, March-April, 1957.

The author suggests that many eye diseases are related either directly or indirectly to the emotions and stress of life; many ocular symptoms and diseases have no known specific causation. He considers the following as diseases of stress and adaptation; 1. nongranulomatous forms of iridocyclitis, 2. retrolental fibroplasia, 3. angiospastic central serous retinopathy, 4. glaucoma, 5. hypertensive retinopathy, and 6. diabetic retinopathy. An excellent bibliography is included. (8 figures, 48 references)

Theodore M. Shapira.

Wiegand, H. R. **The simultaneous roentgenologic demonstration of both optic canals and other details.** *Arch. f. Ophthalm.* 159:191-199, 1957.

The author describes a posture of the head for roentgenography of the orbits and neighboring structures which has certain advantages over certain other positions now in use. (3 figures, 79 references)

F. H. Haessler.

6

OCULAR MOTILITY

Bender, M. B., Postel, D. M. and Krieger, H. P. **Disorders of oculomotor function in lesions of the occipital lobe.** *J. Neurol., Neurosurg. & Psychiat.* 20:139-143, May, 1957.

The authors point out that the associa-

tion of the occipital cortex with vision is well known but motor disturbances of the eyes are rarely attributed to a disturbance in this region of the cerebral cortex. They report two cases of oculomotor abnormality associated with a lesion of the occipital cortex; in one the cortical disturbance was bilateral and in the other unilateral. The concept of an occipital oculomotor field is reviewed. Although a complete physiologic explanation cannot be given it seems clear that the occipital cortex does play a part in oculomotor control. (3 figures, 17 references)

Irwin E. Gaynon.

Bonnet, P. and Bonnet, I. **Progressive bilateral oculomotor paralysis in the aged.** *J. de méd. de Lyon* 899:577-581, June 20, 1957.

Usually after 40 years of age, a paralysis of the lateral rectus muscle may appear. In its early stage the paralysis is unilateral and transient; later it becomes permanent, bilateral and complete and is often accompanied by nystagmus. X-ray studies reveal atheromatous changes in the internal carotid artery within the cavernous sinus. (3 figures)

F. H. Haessler.

Hugonnier, R. **Ocular torticollis.** *J. de méd. de Lyon* 899:595-602, June 20, 1957.

Ocular torticollis, the abnormal posture of the head which is brought about by paralysis of an extraocular muscle, as well as its nature, diagnosis and treatment, are discussed extensively.

F. H. Haessler.

Huysmans, J. **A new treatment of strabismus.** *Ophthalmologica* 133:451-452, June, 1957.

The author's method consists essentially of mechanical stretching of the over-active muscle under the influence of a topical anesthetic and a spreading agent. (3 figures) Peter C. Kronfeld.

Lijó Pavia, J. **Measurement of the deviation in concomitant strabismus.** *Rev. oto-neuro-oftal. Sudam.* 32:9-13, Jan.-March, 1957.

The author has devised a method for exactly measuring the angle of deviation in cases of monocular strabismus of very small degree. He makes use of the fact that it is possible to induce the secondary deviation in the sound eye when the deviated one takes up fixation. If the sound eye is covered by ground glass, it is possible not only to see this secondary deviation, but also to register it by means of a photographic exposure on a film previously exposed with the sound eye fixing.

The author uses a retinographic camera for his double exposures of concomitant squints and shows two examples before and after surgery, the second picture in each case revealing only one light reflex, while the picture taken before surgery reveals two light reflexes on the cornea. (3 figures, 24 references) Walter Mayer.

Lyle, T. Keith. **A congenital structural muscle anomaly—fibrosis of the right inferior rectus and right ptosis.** *Tr. Ophth. Soc. U. Kingdom*, 76:181-185, 1956.

The author presents a patient, 53 years of age, who had had an ocular defect, the right eye pointing downward and the left eye upwards; he tilted his head backward 25° to enable him to fix with the right eye. The diagnosis of fibrosis of the right inferior rectus was made and after four surgical procedures the right eye was brought up and the right ptosis was corrected with a fascial sling operation. (5 figures) Beulah Cushman.

Mackensen, G. **The fixation of amblyopic eyes. Electrooculographic studies.** *Arch. f. Ophth.* 159:200-211, 1957.

In 25 subjects with unilateral amblyopia there was uncertain fixation which is manifest as purposeless or nystagmoid jerky movements and is electrooculographically

demonstrable. Fixation nystagmus and latent nystagmus are easily analyzed on the tracings. Determinations with the ophthalmoscope occasionally differ from the electrooculographic findings and therefore cannot be relied upon without further study. (4 figures, 3 tables, 18 references) F. H. Haessler.

Mackensen, G. **Movement of amblyopic eyes during change of direction of gaze. Electrooculographic studies.** Arch. f. Ophth. 159:212-232, 1957.

In 30 subjects the movements of gaze initiated by the amblyopic eye were compared with those of the normal eye and 10 subjects without sensory or motor disturbances were studied for comparison. The motor disturbance can be ascribed to inadequate sensory function and the insecurity of fixation is probably the result of the increased magnitude of the area of fixation and the consequent loss of po-tence of a unit portion of it. (18 figures, 1 table, 17 references) F. H. Haessler.

Nemetz, U. R. **The effect of pleoptic exercises upon the perimetric findings in strabismus.** Ophthalmologica 133:223-231, April-May, 1957.

The visual field anomalies in untreated concomitant strabismus have been very extensively studied by a number of authors. The present study concerns itself with the effect of pleoptic and surgical treatment on these field anomalies in three types of strabismus, namely, uni-lateral esotropia with amblyopia and ec-centric fixation, unilateral esotropia with amblyopia and centric fixation, and alter-nating esotropia without amblyopia. The principal changes in the field findings at-tributable to the treatment were: 1. di-minution of the central scotoma in the squinting eye at a rate paralleling the improvement in visual acuity, 2. develop-ment, during the treatment period, of a ring-shaped zone of inhibition (ring

scotoma) in the nonsquinting eye after the sensory cooperation of the two eyes had improved measurably, or 3. (instead of phenomenon 2.) sudden onset of diplopia, in cases of normal retinal cor-respondence before the operation and in cases of anomalous retinal correspondence after the operation. These three phenom-ena occurred in all three types of strabis-mus mentioned above. This is the au-thor's conclusion: "The development of a paracentral area of inhibition in the non-squinting eye and the changes in size and weight of the central scotoma in the squinting eye, both occurring during the pleoptic treatment, support the concept that amblyopia is a functional process on the order of internal inhibition and that this process is located in the retina." (3 figures, 11 references)

Peter C. Kronfeld.

Parks, Marshall M. **Strabismus.** A.M.A. Arch. Ophth. 58:136-160, July, 1957.

The 1956 literature is reviewed. (191 ref-erences) G. S. Tyner.

Sokolic, P. **Muscle shortening by tor-sion and ligature.** Ophthalmologica 133:393-396, June, 1957.

This is a modification of the conven-tional tendon tucking operation. Before raising the loop with the tendon tucker, the tendon is twisted 180 degrees which, according to the author, facilitates quick and accurate fixation of the loop by a suture placed and tied around it. The au-thor recommends this modification for particularly nervous or sensitive patients. (6 figures) Peter C. Kronfeld.

Starkievitz, W. **Localization, a method for the treatment of strabismus.** Bull. et mém. Soc. franç. d'opht. 69:343-358, May, 1956.

The close relationship of the two macu-lae in normal eyes and their respective independence in amblyopias is the cause

for anomalous correspondence of muscular origin. Therefore surgery should be performed early, followed by prolonged continuous treatment of localizing methods. The similarity between the improvement of visual performance in amblyopias and the visual recuperation in agnosias and the possibility of an agnostic element in amblyopia and its presumptive influence on the course of therapy are discussed. (5 figures) Alice R. Deutsch.

7

CONJUNCTIVA, CORNEA, SCLERA

Alberth, B. **A case of autokeratoplasty.** *Ophthalmologica* 133:61-64, Jan., 1957.

The 69-year-old male patient had sustained a severe, molten-metal burn of his left eye at the age of 16 years and a penetrating injury of his right eye at the age of 28. The clear cornea of his right eye was used for a penetrating keratoplasty on the left eye. The resulting defect in the right eye was repaired with a donor eye that had been kept in dry storage at room temperature for 152 days and "regenerated" immediately before the keratoplasty by immersion for 30 minutes in saline solution at body temperature. The graft in the right eye took, but became completely opaque. The result in the left eye was an almost clear graft with a visual acuity of 20/200, against eccentric finger counting at a few inches preoperatively. (3 figures, 11 references)

Peter C. Kronfeld.

Barraquer Moner, Jose E. **A case of successful total keratoplasty.** *Ophthalmologica* 133:131-134, Feb., 1957.

The 90-year-old male patient presented himself with a total adherent leucoma, normal tension and good light perception and projection in his right eye and a primary optic atrophy without light perception but a normal anterior segment in his left eye. A total, full thickness kera-

toplasty was performed on his right eye with the left eye serving as the donor. An 11 mm. trephine was used for the initial incision, breaking into the posterior chamber in one small sector. Separation of the iris from the cornea was tried but proved impossible. The entire cornea plus iris was excised with scissors and an 11 mm. graft taken from the enucleated left eye partly sutured in its place. Then the completely cataractous lens was extracted intracapsularly. The keratoplasty was completed by 16 appositional sutures. A severe anterior hemorrhage occurred on the fifth postoperative day. The stitches were removed on the 21st day and the patient was sent home with a clear cornea, blood in the anterior chamber and good light perception. He was examined by another ophthalmologist five years later and found to have 20/65 corrected vision, a clear cornea except for fine peripheral scars corresponding to the stitches, a clear aqueous chamber and a normal fundus. (1 figure) Peter C. Kronfeld.

Crespi Jaime, G. **Subconjunctival hemorrhage.** *Arch. Soc. oftal. hispano-am.* 17: 242-254, March, 1957.

This is an exhaustive review of the etiology of subconjunctival hemorrhages, unimportant in most cases and quite grave in some. Four unusual cases are reported. One severe hemorrhage followed a hard cough caused by the aspiration of a piece of meat, and in one case repeated subconjunctival hemorrhage was cured by localizing and cauterizing the bleeding vessel. In a third case severe and prolonged hemorrhage followed a pterygium operation. The history subsequently revealed that this patient had severe traumatic hemorrhages for a period of five years, bleeding profusely after surgical procedures or minor injuries. A fourth case was that of hemorrhage in the lymphatics of the conjunctival network. The literature on this type of hemorrhage is reviewed in

detail. The author points out that there is a local vascular fragility, not elucidated by general tests. Therapy is determined largely by the etiology. The author counsels that the preoperative history of patients be given careful consideration. (1 figure)
Ray K. Daily.

Cuendet, J. F. **The treatment of keratoconjunctivitis sicca.** *Ophthalmologica* 133:255-259, April-May, 1957.

In 1944 Vannotti and associates studied the carbohydrate metabolism in a number of cases of Sjögren's syndrome and found it to be sufficiently abnormal to attribute the disease to an insufficiency of cellular catalyzers. Following this idea Cuendet treated five typical cases of Sjögren's syndrome with cocarboxylase preparations (Berolase made by Roche or Bivitasi made by Calosi). The patients also received a vitamin B complex and an eye wash. The objective and subjective result of this combined treatment was decidedly better than that of purely topical medications. (1 figure, 9 references)
Peter C. Kronfeld.

De Toledo, C., Vallejo-Freire, A., Oliveira, B. and Souza, P. **Electronic microscopy of the human conjunctiva.** *Rev. Bras. Oftal.* 16:219-229, Sept., 1957.

During studies done with the electronic microscope the authors found some characteristic aspects of the human conjunctiva which they report in this study. The epithelial cells of the conjunctiva are united by microvilli by simple contact, without connecting bridges. These microvilli contain cytoplasm but no other elements. The cells situated in the distal portion of the epithelium lose their microvilli. It has been frequently observed that when a leucocyte interposes itself between two of the epithelial cells, a cell membrane surrounds the white blood cell and a continuous linear contact is established. (6 figures, 9 references)
Walter Mayer.

Flynn, Frank. **Trachoma among natives of the northern territory of Australia.** *M. J. Australia* 2:269-279, 1957.

The author summarises previous ophthalmic surveys among the aboriginals of the Northern Territory of Australia. He favours Ida Mann's clinical classification of the stages of trachoma. The briefest summary form of these stages is: Stage A, active; Stage A-B, transition from stage A to later stages; Stage B, condition healed with good sight; Stage C, condition healed with impaired sight; Stage D, patient blind from trachoma. The severity index is the ratio of the cases in stages C and D, to the total number of cases B, C and D. The severity of the disease varies in different areas probably due to secondary infections and climatic conditions. The combined effect of low humidity, wind, heat and dust is important. Transmission is thought to occur by direct personal contact. Bush flies may spread the disease but are likely to be more important in the spread of secondary infections. The paper also discusses the infective agent, the high incidence, the course of the disease, treatment and prevention. (6 figures, 2 tables, 17 references)
Ronald Lowe.

Franceschetti, A., Jaccottet, M. and Jadossohn, W. **Corneal manifestations of keratosis follicularis spinulosa decalvans (Siemens).** *Ophthalmologica* 133:259-263, April-May, 1957.

The essential features of this rare hereditary skin affection are well described by its name. The following hyperkeratosis makes the skin look and feel like a rasp. The eye manifestations, punctate superficial corneal opacities with peripheral vascularization and intense photophobia, are very much in the foreground. In one of two brothers with the typical skin and eye findings a corneal biopsy (lamellar keratectomy) was done and revealed vesicles in the epithelium, almost

complete absence of Bowman's membrane and vascularization of the anterior stroma. (4 figures, 10 references)

Peter C. Kronfeld.

Hirose, K., Yoshioka, H., Abe, S., Kanemitsu, J. and Kiya, K. **Effect of cortisone on experimental keratomycosis.** *Acta Soc. Ophth. Japan* 61:1106-1133, Aug., 1957.

Five human cases of corneal infection with *Candida* were observed. The infection became manifest after the topical use of cortisone. In most of the cases an abnormal carbohydrate metabolism of the system was demonstrated also. In rabbits the corneal infection with *Candida* was also accelerated by topical cortisone. The acceleration was particularly striking in animals with alloxan diabetes. (40 figures, 5 tables, 11 references)

Yukihiko Mitsui.

Hofmann, H. **Keratitis numularis of Dimmer.** *Arch. f. Ophth.* 159:117-158, 1957.

The author summarizes the entire literature on keratitis numularis of Dimmer. He considers the Asian keratitis punctata tropica an identical disease. Numular keratitis is an agricultural malady and the cornea alone is the seat of pathologic change; the other segments of the eye remain normal. The disease must be differentiated from epidemic keratoconjunctivitis and from herpetic affections. Histologic studies revealed cells comparable to those of virus infections. The examination of fresh lesions suggests that the infiltration begins just behind Bowman's membrane.

In the experimental studies it was found to be very difficult to transfer the infection and to grow an infective agent. Hofmann succeeded in: 1. transferring the virus to produce lesions in the rabbit cornea by intracorneal inoculation, 2. growing the virus on chorio-allantois membrane of hens' eggs which had been in-

cubated for 9 to 11 days, 3. estimating the size of the virus by filtration, and 4. serial transfer of the filtrate to chorio-allantois membrane, rabbit's cornea and human cornea. The studies make it probable that the virus has been identified as the cause of the disease. The virus probably gains entrance through slight foreign-body injury, particularly in harvesters of grain. (22 figures, 3 tables, 43 references)

F. H. Haessler.

Kamata, W. **An experimental study of hetero-keratoplasty.** *Acta Soc. Ophth. Japan* 61:1098-1106, Aug., 1957.

A transplantation of chick cornea into rabbits failed. However, when the chick cornea was stored in rabbit serum for three days prior to the implantation, a permanent result was obtained. A whole cornea was stored in the serum and a lamellar keratoplasty was employed after the storage. When the cornea of cat, dog and man was used in rabbits the implantation was unsuccessful even after a storage in rabbit serum. (12 figures, 2 references)

Yukihiko Mitsui.

Knuesel, Otto. **New observations on the normal and diseased conjunctiva.** *Ophthalmologica* 133:211, April-May, 1957.

Knuesel has continued his biomicroscopic studies of the fluoresceine- or trypanblue-stained conjunctiva in ultraviolet light. He now describes a number of findings possibly related to lymphatics and lymph nodules in the conjunctiva.

Peter C. Kronfeld.

Kobayashi, S. and Hirota, M. **A study of the virus of epidemic keratoconjunctivitis.** *Acta Soc. Ophth. Japan* 61:1043-1050, Aug., 1957.

A strain of adenovirus type 11 was isolated from a case of clinical epidemic keratoconjunctivitis in HeLa cell culture. The cultivated virus was inoculated into

two human volunteers. In both cases an acute conjunctivitis resulted; in one the conjunctivitis was severe and follicular. Systemic symptoms were absent, but the conjunctivitis was followed by a keratitis similar to that of keratoconjunctivitis. In the second case the conjunctivitis was catarrhal and mild and was not followed by keratitis. In both cases the neutralizing antibody to type 11 adenovirus in the serum was less than 10 in the titer. A definite rise in the antibody titer was demonstrated in the convalescent stage. (11 figures, 2 tables, 24 references)

Yukihiko Mitsui.

Kunitomo, N., Asakage, T., Mori, S., Miyata, Y. and Dake, N. **New classification of trachoma.** *Acta Soc. Ophth. Japan* 61:1005-1015, Aug., 1957.

This classification is a result of a periodic observation of new-born infants for two years for the development of trachoma in an enormous population in several districts throughout Japan. The initial symptoms of trachoma are always accompanied by more or less acute inflammatory signs, though in most cases the trachoma is pure without bacterial contamination. Clinically most cases of trachoma appear to be a subacute conjunctivitis at the onset and less frequently to be quite acute. An insidious onset has never been seen. In infants trachoma affects the lower lids more severely than the upper. The authors point out a weakness of MacCallan's classification of trachoma in that it does not include an acute stage at the onset of the disease. (2 figures, 3 tables, 5 references)

Yukihiko Mitsui.

Leigh, A. G. **The choice of case for perforating keratoplasty.** *Tr. Ophth. Soc. U. Kingdom* 76:97-105, 1956.

An optimum graft 5.0 mm. in diameter has been made by the author by punching out the donor cornea; the recipient cornea

is cut by a trephine and held in place with indirect sutures. Children under 16 years of age are unsuitable, but there is no upper limit. Full cooperation of the patient during surgery and in the post-operative period must be obtained for the best results.

To support a graft the cornea must be recognizable as cornea; the presence of gross vascularization either superficial or deep is a contraindication for perforating keratoplasty. Anesthesia of the cornea is also a contraindication. In Groenow's dystrophy a clear graft can be expected, but in Fuchs' dystrophy the outlook is poor.

In the presence of a cataract a perforating keratoplasty should always be done prior to the extraction and the removal of the cataract should not be performed for a year.

Beulah Cushman.

Nano, Héctor M. **Long-term results of 119 keratoplasties.** *Ann. d'ocul.* 190:587-596, Aug., 1957.

The author lists the results of his keratoplasties one year after grafting in a series of six tables. In all, 54 percent had a good anatomical result (graft remained clear) and 44 percent had a good functional result (visual acuity improved). The best results were obtained in keratoconus and the poorest in cases of bullous keratopathy and tuberculous and herpetic keratitis. An interesting series of 19 therapeutic grafts is included (done for acute corneal disease) in which 16 patients showed an improvement in final visual acuity. (6 tables)

David Shoch.

Paiva, C. **Keratoplasty.** *Rev. brasil. oftal.* 16:19-41, March, 1957.

The author gives a summary of the history of keratoplasty from the first attempts to replace the diseased cornea by glass to the modern procedures which he describes in detail. He also deals with the indications for keratoplasty. The layman has come to believe that keratoplasty is a

cure for all cases of blindness and it is the ophthalmologist's duty to correct this erroneous belief. The author then reviews indications, contraindications, technique and complications of penetrating and lamellar keratoplasty and summarizes his personal cases. (27 references)

Walter Mayer.

Postic, S. **The trachomatous follicle; its pathologic significance and its relationship to the trachoma virus.** *Ann. d'ocul.* 189:867-879, Oct., 1956.

The author feels that all follicles due to virus infection are the same etiologically but that trachoma follicles are found in the deeper structures because the virus penetrates the epithelium rather than being attached to the epithelial cells as in paratrachoma and molluscum contagiosum. He emphasizes that the follicle-stimulating substance is the trachoma virus rather than a soluble toxin from the destroyed cells in the conjunctiva. He proves this by inoculating the conjunctiva of a normal eye with the contents of a subepithelial follicle from a proven case of trachoma. A true trachoma results. He feels that the virus is present in an "invisible" form since v. Prowazek inclusion bodies cannot be demonstrated. (6 figures, 13 references)

David Shoch.

Radnot, M. and Gall, J. **Interstitial keratitis and endocrine disturbances.** *Klin. Monatsbl. f. Augenh.* 131:254-256, 1957.

A 41-year-old woman had keratitis and iritis in her only eye; the other eye had been enucleated six years earlier because of keratitis and uveitis. The serologic tests for syphilis were negative and an anti-tuberculous chemotherapy healed the inflammation. The patient had a moon-face and the sella was enlarged. (2 figures, 2 references)

Frederick C. Blodi.

Rutkowski, Slawomir. **Problems of keratoplasty. II. Analysis of Filatov's tech-**

nique. *Klinika Oczna* 27:109-116, 1957.

Experimental transplants of rabbit's cornea were made according to Filatov's technique, which was characterized by the use of a conjunctival flap to cover the transplant. It became clear that clotting of the secondary aqueous in the rabbit presents a special problem. Delayed placing of the transplant, delay or uneven placing of the conjunctival flap resulted in the formation of excessive amount of clot which in turn resulted in clouding of the transplant. Proper technique required preparation of the conjunctival flap with proper placing of sutures. The transplant had to be put into the recipient cornea and covered by the conjunctiva within one minute. (7 figures, 3 references) Sylvan Brandon.

Sugar, H. S., Riazi, A., and Schaffner, R. **The bulbar conjunctival lymphatics and their clinical significance.** *Tr. Am. Acad. Ophth.* 61:212-223, March-April, 1957.

The authors investigated this subject as a result of their dissatisfaction with the treatment of conjunctival lymphangiectasia. As a result of their studies they recommend excision of the involved superficial conjunctiva as the best treatment for lymphangiectasia. They discuss the anatomy of the lymph channels of the conjunctiva. (8 figures, 1 table, 21 references)

Theodore M. Shapira.

Valiere-Vialeix and Robin, A. **Epidermoid epithelioma of the conjunctiva of the upper lid following pemphigus.** *Bull. et mém. Soc. franç. d'opht.* 69:253-254, May, 1956.

A 52-year-old woman, blind for many years because of a bilateral pemphigus, developed a keratinizing epithelioma, apparently originating from the conjunctiva. This epithelioma covered the cornea and replaced the essential tissues of the upper

blood count. She is being maintained on daily replacement therapy with cortisone

sign was a fine pepper dust in the retina. (5 microphotographs) Ray K. Daily

lid, but spared the lower lid. Its intra-palpebral papillomatous part was very friable and its surface desquamation caused an offensive odor. The tumor was soft on palpation and sensitive to touch. The diagnosis of keratinizing epithelioma was made on biopsy. Its origin was ascribed to the tarsal conjunctiva which in spite of having a cylindrical epithelium is of Malpighian origin and a metaplasia in this direction therefore should not be too surprising. In spite of the rareness of similar cases and the rareness of pemphigus, progressive sclerosis, fibrosis and keratinization of the conjunctiva ensuing during the course of this disease undoubtedly predispose to malignant transformation similar to the malignant changes in scars after conjunctival burns or late trachoma. An exenteration of the orbit was performed in this patient. However, X ray should have been considered first in preference to such a mutilating operation. A detailed pathologic analysis of the surgical specimen is given and the unique clinical appearance is described. The etiology and structure of intraepithelial tumors, especially of the upper lid, are briefly reviewed. (3 figures)

Alice R. Deutsch.

Vrabec, F. **Neurohistologic study of a case of lattice-type of corneal dystrophy.** *Ophthalmologica* 133:160-169, March, 1957.

The 66-year-old female patient whose eyes became available for histologic study through a fatal automobile accident was the youngest of three sisters all of whom showed bilateral corneal dystrophy of the lattice type. The neurohistologic examination revealed dystrophic changes of all corneal nerve trunks as well as of the keratoblasts. The primary lesion seemed to be located in the elements that make up Schwann's sheaths. (13 figures, 15 references)

Peter C. Kronfeld.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Azeredo, A. **Reticulo-endothelial system in the uvea.** *Rev. brasil. oftal.* 16:127-174, June, 1957.

This thesis for admission to the teaching staff at the university is a discussion of the author's experiments with different vital dyes on the reticulo-endothelial system of the uvea. He summarizes the functions of the reticulo-endothelial system in general and in the uvea. He then analyzes his studies with vital dyes and the uptake by the elements of the system in the uvea. He also studies the uptake of dyes after the experimental animals have been treated systemically with cortisone and hyaluronidase.

Walter Mayer.

Blondet, P., Dargent, M. and Paufigue, L. **Choroidal metastases of a breast cancer treated by ovariectomy and adrenalectomy.** *Ann. d'ocul.* 190:567-575, Aug., 1957.

A 36-year-old woman had a radical breast resection for carcinoma in 1952. Three years later (1955) metastases were found in the dorsolumbar spine and X-ray treatment begun. In September, 1955, a bilateral ovariectomy was performed and male sex hormone therapy instituted. In May, 1956 enormous metastases were seen in the choroid of the right eye but only a small area of choroiditis in the left eye. Shortly after this a bilateral adrenalectomy was done. In November, 1956, the choroidal metastases in the right eye had completely disappeared to be replaced by areas of choroidal atrophy. The lesion in the left eye had disappeared completely. There has been no change up to May, 1957. There has been a parallel improvement in the general state of the patient with disappearance of bony metastases, a gain in weight and improvement of the

blood count. She is being maintained on daily replacement therapy with cortisone. David Shoch.

Braley, A. E. and Hamilton, H. E. **Central serous choroidosis associated with amebiasis.** A.M.A. Arch. Ophth. 58:1-14, July, 1957.

The authors associate amebiasis with central choroiditis and document their paper with nine case reports. The fundus lesions are cystic in nature and often may be associated with hemorrhage. The lesions may be bilateral and are central or paracentral. There is a similarity in appearance to angiospastic or central serous retinopathy. The lesions respond to antiamebic therapy, Diiodohydroxyquin, Chloroquine, Carbarson, and Fumagillin. The disease is adversely affected by steroids. (4 figures, 3 references)

G. S. Tyner.

Chodos, J. B. and Maeder, G. **Familial neurofibromatosis of the iris.** Ophthalmologica 133:237-241, April-May, 1957.

Two brothers with typical skin and other manifestations of Recklinghausen's disease showed a large number of round or spindle-shaped iris nodes without any other abnormal eye findings. (2 figures, 15 references) Peter C. Kronfeld.

Cortes de Los Reyes, Hernan. **A case report of a cure of sympathetic ophthalmia.** Arch. Soc. oftal. hispano-am. 17:259-263, March, 1957.

In a case of sympathetic ophthalmia in an eight year old child, verified histologically in the injured eye, the sympathizing eye was cured by administration of ACTH intravenously, streptomycin intramuscularly, and atropine and cortisone locally. This report was written three months after all treatment has been discontinued, when visual acuity was normal, the refractive correction was the same as before the disease, and the only residual

sign was a fine pepper dust in the retina. (5 microphotographs) Ray K. Daily.

Di Pinto, F. **Sympathetic ophthalmia treated with Irgapyrin.** Rev. oto-neuro-oftal. Sudam. 31:163-165, Oct.-Dec., 1956.

The author reviews the use of Irgapyrin in inflammatory diseases of the anterior segment of the eye. Among inflammations of the posterior pole only retrobulbar neuritis was benefited by the use of Irgapyrin, according to the literature reviewed by the author. He describes a patient with a knife wound of the right eye, operated on 24 hours after the accident, who developed severe iritis during the postoperative course, followed one month after the accident by a severe iritis in the left eye. After the appearance of symptoms in the left eye the patient was treated with several antibiotics and ACTH and after a few days a first series of Irgapyrin injections was added and in short intervals two further series of five injections each. Because of the slow progress the right eye was enucleated a month after symptoms were noted in the left eye. After enucleation the patient received another series of Irgapyrin and his visual acuity improved in a spectacular manner.

Walter Mayer.

Fischer-Franz. **Diabetic choroiditis.** Arch. f. Ophth. 159:105-111, 1957.

The author states that in recent studies R. Thiel had been able to demonstrate histologically the involvement of choroidal vessels in diabetic retinopathy. The present report ophthalmoscopically describes four patients with choroidal foci near and in the macula, retinal hemorrhages and vascular changes. The author calls this diabetic form of oculopathy "choroiditis diabetica." (9 references)

Ernst Schmerl.

Georgiades, G. **Heterochromia cataract.** Bull. et mém. Soc. franç. d'opt. 69:470-487, May, 1956.

Hewson, G. E. **Iritis due to herpes virus.** Irish J. Med. Sc. 6:372-373, Aug. 1957.

whom other methods of treatment were ineffective; improvement was obtained

The author classifies the different, vaguely differentiated groups by minor specific individual characteristics. The classical syndrome of Fuchs' heterochromia, with hypochromic iris, corneal precipitates and cataract was seen in 70 cases. The syndrome characterized by hypochromia and cataract without corneal precipitates was observed in nine patients and the syndrome hyperchromia with cataract in six. Unilateral discoloration of the iris and severe sclerosis of the iris vessels were characteristic for all three types. The cataracts were mostly total; only in Fuchs' heterochromia the initial stage of the cataract was restricted to the posterior cortex. The permeability of the blood-aqueous barrier was always increased in Fuchs' heterochromia and only in Fuchs' heterochromia filiform hemorrhages in the chamber angle were visible after anterior chamber puncture. The microscopic examinations of the iris showed that the iris pigmentation was normal and that the apparent discoloration of the iris was caused by loss of the normal spongy structure and its replacement by fibrous tissue, covering the pigment layer, and favoring increased reflection of light. In the hyperchromic cases an accumulation of pigment was found in the anterior layers of the iris. A mild infiltration of the iris and vitreous opacities were found in Fuchs' heterochromia; reticulo-endothelial cells of a peculiar shape, not previously described, were found only in the latter cases. It is emphasized that the corneal precipitates, the lymphocytic infiltrations of the iris and the cataracts were sequelae of vascular disturbance and not part of an inflammatory disease. The Fuchs syndrome in particular, often combined with cervical osteophytosis and arthrosis and diverse psychic disturbances, should be considered as a neuro-ophthalmologic syndrome and unnecessary anti-inflammatory treatment should be avoided. The number of patients seen

by the author is surprising, considering the rarity of this disease in other parts of the world. (5 figures, 36 references)

Alice R. Deutsch.

Giardulli, A. **Essential atrophy of the iris.** *Rev. brasil. oftal.* 16:59-66, March, 1957.

A patient with a patch of essential atrophy of the iris, with normal visual field and normal ocular tension developed chronic simple glaucoma after almost two years and a marked increase in the iris atrophy. The author also reviews the entire literature on the subject. (4 figures, 11 references)

Walter Mayer.

Gimenez Almenara, Julian. **Essential atrophy of the iris.** *Arch. Soc. oftal. hispano-am.* 17:264-268, March, 1957.

The literature is reviewed and a case of essential atrophy of the iris with absolute glaucoma of five years duration, in which the tension was controlled by two cyclo-diathermies, is reported. After one cyclo-diathermy in the lower portion of the eyeball the tension remained low for one month and then rose again. After the second cyclodiathermy in the upper half of the eyeball the tension remained low and the eyeball, which previously was irritable and painful, remained free of pain. (8 references)

Ray K. Daily.

Grignolo, A., Schepens, C. L. and Heath, P. **Cysts of the pars plana ciliaris.** *A.M.A. Arch. Ophth.* 58:530-543, Oct., 1957.

The authors report extensive cysts of the pars plana ciliaris in 26 eyes of 20 patients. They believe that traction on the ciliary epithelium of the pars plana is an essential etiologic factor. Contusion of the globe and myopia may also be factors. The relationship to retinal detachment is discussed. (16 figures, 27 references)

G. S. Tyner.

tual manner. Specific treatment against the various known etiologic factors as

Rosado Rodriguez, Enrique. **A case of Still's disease.** *Arch. Soc. oftal. hispano-*

Hewson, G. E. **Iritis due to herpes virus.** Irish J. M. Sc. 6:372-373, Aug., 1957.

A patient with recurrent acute iritis developed herpetic vesicles on the forehead. Aqueous was inoculated on scarified corneas of two rabbits and the formation of vesicles with the typical microscopic appearance of infection of herpes simplex followed. (3 references)

Irwin E. Gaynon.

Hotz, G. **The therapy of choroidal metastases of breast carcinoma.** Ophthalmologica 133:357-361, April-May, 1957.

Choroidal, pulmonary and pelvic-bone metastases developed in this 45-year-old female patient four years after a radical breast operation plus X-ray therapy. Oophorectomy was followed by general improvement and some regression of the ocular tumors, lasting about a year. Then new ocular metastases were observed for which the patient is being treated with male sex hormone. (6 references)

Peter C. Kronfeld.

Ikui, H., Kimura, K. and Iwaki, S. **Electron-microscopic study of sympathetic ophthalmia in ultrathin sections.** Acta Soc. Ophth. Japan 61:1194-1210, Aug., 1957.

In this electron microscopic study of an eye with sympathetic ophthalmia, the authors found virus-like corpuscles of 40-75 m μ in diameter in epithelioid cells. (23 figures, 21 references)

Yukihiko Mitsui.

Morozov, V. **X-ray therapy in iritis and iridocyclitis.** Vestnik oftal. 4:34-41, July-Aug., 1957.

X-ray therapy was given to 215 patients of whom 85 had endogenous iritis and iridocyclitis, 58 postoperative, 55 traumatic, 9 sympathetic uveitis and 8 endophthalmitis; 184 patients were hospitalized and were followed daily with biomicroscopy. There were 26 patients with advanced tuberculous uveitis in

whom other methods of treatment were ineffective; improvement was obtained in eight of 10 patients with plastic iridocyclitis with synechia. The best results were obtained in the nodular form; the least favorable ones in serous and plastic iridocyclitis. In nine patients, with sympathetic ophthalmia there was no improvement.

Good results were obtained in iridocyclitis of bacterial or exogenous origin in 152 patients (70.7 percent), no improvement in 55 patients (25.6 percent), and eight eyes had to be enucleated. No complications were observed during the period of about two and one half years. Narrow glass tubes covered with lead (25 to 30 mm. in diameter) with a focal distance of 30 cm. were used for the irradiation. The Roentgen rays act favorably on the course of inflammatory diseases of the iris and ciliary body. Better results were noted in the use of rays of medium hardness (100-130 g). Small doses, 10 to 30r, should be used with short intervals of one to three days and a general dose of 100 to 250r. A strictly individual approach in each case is important. Best results were obtained with X-ray therapy in postoperative, traumatic and tuberculous iritis and iridocyclitis. Iridocyclitis of rheumatic origin did not respond to the therapy.

The treatment should be applied early, as the X-ray therapy was most effective in acute and fresh iridocyclitis. There was decrease of pain and of the inflammatory process. Since no complications were observed, this type of therapy can be applied widely in iridocyclitis of various origin. (2 drawings) Olga Sitchevska.

Nielsen, R. H. and Kirby, T. J. **The modern treatment of uveitis.** A.M.A. Arch. Ophth. 58:79-108, July, 1957.

This is a well written article in which the present concept of treatment of uveitis is reviewed in an interesting and fac-

tual manner. Specific treatment against the various known etiologic factors as well as general treatment and studies of nonspecific inflammation are outlined. It is a handy reference for office and hospital practice. (105 references) G. S. Tyner.

Ogg, A. J. **Complete retroflexion of the iris with retention of normal vision.** *Brit. J. Ophth.* 41:440-441, July, 1957.

A 20-year-old boy received an accidental blow to the right eye. A small corneal rupture was seen with complete retroflexion of the iris. The eye healed well with normal vision but the iris remained in this position completely adherent to the ciliary body. The lens and zonula remained intact. (1 figure, 2 references) Morris Kaplan.

Reese, A. B. **The differential diagnosis of malignant melanoma of the choroid.** *A.M.A. Arch. Ophth.* 58:477-482, Oct., 1957.

Reese reports 214 patients whose fundi made one consider melanoma. 106 proved to be pseudomelanomata, 84 were correctly diagnosed as melanoma, 10 diagnoses were incorrect, and 14 were lost in follow-up. Of the 106 simulating lesions, there were 39 due to inflammation, 21 cases of macular degeneration, 16 melanomata of the choroid, 9 of metastatic carcinoma, 9 of serous detachment, and the remainder, miscellaneous.

The author discusses diagnosis in detail and makes many valuable suggestions. He says that the best aid in diagnosis is retroillumination by a method which he describes. Other valuable signs pointing to melanoma are brown pigmentation, abnormal vascular pattern, and new-formed or dilated episcleral vessels. Too much emphasis cannot be placed on the importance of examining the fellow eye. This article should be read in its entirety. (3 figures, 2 in color, 5 references)

G. S. Tyner.

Rosado Rodriguez, Enrique. **A case of Still's disease.** *Arch. Soc. oftal. hispano-am.* 17:280-283, March, 1957.

The author reports a case of recurrent acute attacks of polyarthritis complicated by bilateral iridocyclitis in a girl, six years of age. The nature of this syndrome is briefly discussed. (2 figures)

Ray K. Daily.

Rosselet, E. and Deller, M. **Chorioretinal lesions associated with Kaposi's sarcoma.** *Ophthalmologica* 133:361-364, April-May, 1957.

The first manifestations of illness in the 46-year-old male patient were a possible myocardial infarct, followed by severe weakness, vascular hypotension, cough, hemoptysis and nocturnal sweating. A few weeks later he developed multiple cutaneous nodes, small nodular shadows in his chest X-ray film and jaundice. Biopsy of one of the skin nodes led to the diagnosis of angiosarcoma of Kaposi. In the wake of a few localized retinal hemorrhages a sharply circumscribed area of retinal elevation appeared in one eye and disappeared after X-ray therapy. The patient died of a cerebral vascular accident a few months later. Autopsy was not performed. The fundus lesion is assumed to have been a choroidal angiosarcomatous node. (1 figures, 6 references)

Peter C. Kronfeld.

Stanworth, A. and McIntyre, H. **Aetiology of uveitis.** *Brit. J. Ophth.* 41:385-420, July, 1957.

This exhaustive study of the etiology of uveitis is divided into four principal categories, namely: dental infection, upper respiratory tract and other infections; systemic diseases; discussion of the general aspects of the cause of uveitis.

For almost 50 years there has been a general tendency to associate uveitis with focal sepsis and the literature through the years has included series of

cases of the disease ascribed entirely to foci of infection and other series in which it was proved that none of the cases were so caused. The results of treatment of these infections have been equally contradictory. The published studies have failed to provide any real indication of the importance of focal infection.

In this series all new patients with any type of uveitis were referred for complete dental examinations. The results rather clearly indicated that there was no relationship between the incidence of uveitis and of dental sepsis.

The tonsils and streptococcal infection of the throat and nasal sinuses have very frequently been identified etiologically with uveitis and in this series all patients were also routinely referred for radiographs of the sinuses and for cultures of the nose and throat. The association of infections in this area with the eye disease was found to be statistically unconvincing. However, adequate treatment of a coexisting infection, particularly when due to streptococcus, hastened recovery of the uveitis.

In the search for possible causal factors in general systemic diseases, two patients were found in whom syphilis was the probable cause of the uveitis and four in whom it was gonorrhea. Diabetes was ruled out as an etiologic factor; in tuberculosis and sarcoidosis there may be a causal relationship although no definite association could be established. Even in toxoplasmosis no definite etiologic relationship could be established with the same assurance as in allergy and virus infections. (15 tables, 61 references)

Morris Kaplan.

Stucchi, C. and Bianchi, G. **Depigmentation of a sector of the iris following muscle transplantation.** *Ophthalmologica* 133:231-236, April-May, 1957.

In four cases of traumatic sixth nerve

palsy partial tendon transplantations after Hummelsheim plus resection of the lateral rectus muscle and recession of the medial were followed by a mild transient iridocyclitis and a permanent atrophy of the temporal sector of the iris. The authors attribute these tissue changes to serious interference with the blood supply to the iris and recommend that the operation be divided into two stages which would permit the establishment of collateral circulation before the medial rectus muscle and its arteries are severed. (2 figures, 37 references)

Peter C. Kronfeld.

Witmer, R. **Phakogenic uveitis.** *Ophthalmologica* 133:326-329, April-May, 1957.

The essential features of the disease called phakogenic uveitis by the author are: 1. uveitis with cataract, both increasing in magnitude and severity despite all usual forms of antiuveitis treatment, 2. secondary glaucoma, 3. demonstrable antibodies to lens protein in the aqueous, 4. "crumbly-looking" precipitates and 5. a more or less favorable response to lens extraction. Three cases probably belonging to this category are reported. (2 references)

Peter C. Kronfeld.

Yoshida, E. **Pathogenesis of idiopathic uveitis.** *Acta Soc. Ophth. Japan* 61:1211-1237, Aug., 1957.

When the subretinal exudate from idiopathic uveitis (Harada) is injected into the vitreous of rabbit eyes, a uveitis results. However, a serial passage of this uveitis is not possible. When the original material is inoculated into the chorioallantoic membrane of chick embryo, the chorioallantoic fluid becomes capable, in a course of 10 to 13 days, of causing uveitis in the rabbit eye by an intravitreal injection. Even after a serial passage through chick embryo the capacity does

not decrease. Yoshida thinks that a "uveitis virus" may be isolated in the chick embryo. (10 figures, 10 tables, 37 references)

Yukihiko Mitsui.

9

GLAUCOMA AND OCULAR TENSION

Araujo, F. **Tonographic study of 188 normal eyes.** *Rev. brasil. oftal.* 16:107-126, June, 1957.

The author gives a historical review of tonography and relates his findings in calculating the resistance to outflow of aqueous in 188 normal eyes. He tabulates his results according to age, race and sex. The author concludes, in view of his findings, that a center must exist which regulates the production of aqueous and the balance between outflow and production, in order to maintain the ocular tension in normal limits. (12 tables, 3 graphs, 22 references)

Walter Mayer.

Artemiev, N. and Sinenkova, E. **The pathologic examination of eyes enucleated because of absolute glaucoma.** *Vestnik oftal.* 5:45-49, Sept.-Oct., 1957.

A pathologic examination of 32 eyes with absolute glaucoma was made in the Astrakhan Medical Institute. In 27 eyes histologic changes common in glaucoma were found. In one eye ossification in the region of the ciliary body was found; in two there was a large subretinal hemorrhage and in two a malignant melanoma of the choroid. The ossification of the ciliary body might have been discovered had the eye been examined by X rays. The eyes with the malignant melanoma had incomplete obliteration of the angle of the anterior chamber. In all other eyes there was complete obliteration of the angle; this should be looked for when malignant melanoma is suspected (as it should be in unilateral absolute glaucoma) and antiglaucoma operations should be withheld. Enucleation is justified in any

eye with absolute glaucoma, since the media and fundus cannot be examined.

Olga Sitchevska.

Bick, M. W. **Pigmentary glaucoma in females.** *A.M.A. Arch. Ophth.* 58:483-494, Oct., 1957.

The author reviews the literature and discusses the relationship to Krukenberg's spindle. Five cases of atrophy of the pigment epithelium of the iris are presented, four showing classical pigmentary glaucoma. Control of pressure in these cases is difficult. (9 figures, 6 references)

G. S. Tyner.

Birge, Henry L. **Prodromal malignant glaucoma.** *Connecticut State M.J.* 21:699-702, Aug., 1957.

Prodromal malignant glaucoma occurs in cases of microcornea, where the lens becomes too large after surgery or cataract formation, extreme hyperopia, advanced age, and in narrow-angle glaucoma. The increased size of the lens in relation to the eye or the anterior chamber plus the fact that the ocular tension becomes uncontrollable under medical therapy determines the indication for surgery. Most clear lenses have upon removal given clinical evidence of cataractous changes, even though they were not visible on ophthalmoscopy through the miotic pupil. A combined cataract extraction with sclerectomy or iridencleisis is advocated. (28 references)

Irwin E. Graynon.

Boeck, J., Hellauer, H. and Umrath, K. **The occurrence of a substance in the aqueous in glaucoma resembling the exciting material produced by sensory nerves.** *Arch. f. Ophth.* 159:81-87, 1957.

Subcutaneous or intraarterial injection of extracts obtained from the posterior roots of the spinal cord produce a hyperemia in rabbits' ears. The substance caus-

ing this effect in areas freed from sensory nerves is considered a special factor produced by sensory nerves. The authors checked the aqueous of glaucomatous persons with respect to the occurrence of such a factor and found it definitely present. It was completely or almost completely absent in normal eyes. The factor found in the aqueous in glaucoma is considered to be the same as the one which occurs in extracts of sensory nerve endings. (1 figure, 2 tables, 22 references).

Ernst Schmerl.

Eberharting, W. and Schenk, H. **The effect of Apresoline and Nepresol upon the intraocular pressure.** *Ophthalmologica* 133:406-413, June, 1957.

Apresoline and Nepresol are antihypertensive agents of the hydralazine type. They were used by the authors in patients with chronic simple glaucoma and hypertensive cardiovascular disease. Apresoline given in single retrobulbar or intramuscular doses of 20 mg. caused a drop in diastolic and systolic blood pressure associated with a definite rise in ocular tension lasting about two hours. These effects were much less pronounced if the intramuscular or retrobulbar administrations were preceded by gradually increasing peroral doses of the drug. Since that is the conventional method of using hydralazines in the treatment of hypertensive disease the danger of serious rises of the ocular tension is probably slight. (10 references)

Peter C. Kronfeld.

Etienne, R. and Pommier, M. L. **A study of pigmentary glaucoma.** *Ann. d'ocul.* 190:491-499, July, 1957.

The authors report a case of pigmentary glaucoma which meets all the qualifications established for this diagnosis: young male, myopia, open angle and dense pigmentation of the entire trabeculum. However, a Krukenberg spindle was not present. The authors feel that pigmentary

glaucoma is really a form of congenital glaucoma rather than a secondary glaucoma. Therefore a bilateral LaGrange irido-sclerectomy was done and with good results. (1 figure, 9 references)

David Shoch.

Forres-Estrada, A. **Glaucomatous excavation of the disc.** *Bull et mém. Soc. franç. d'opht.* 69:289-308, May, 1956.

The importance of minute changes of the disc as an early diagnostic sign in glaucoma is emphasized. Exact knowledge of the embryology, anatomy and pathology of the human eye is essential for the understanding and interpretation of the findings. It is the author's contention that the optic nerve is independent of any scleral connection and that the lamina cribrosa is entirely of glial origin. This controversial concept is documented by numerous photographs. The glaucomatous cupping develops by uniform depression of the whole disc, by an enlargement of the physiologic cupping or by a combination of these two processes. The physiologic cupping is identified with the central perivascular space and with residuals of the fetal cleft of the secondary optic vesicle. The successive stages in these different patterns is demonstrated by fundus pictures and corresponding explanatory schematic drawings. On the basis of these periods in the development of glaucoma a new classification and nomenclature of glaucoma was suggested. (19 figures)

Alice R. Deutsch.

Foulds, W. S. **Tonography in the early diagnosis of closed-angle glaucoma.** *Tr. Ophth. Soc. U. Kingdom* 76:83-95, 1956.

The facility of aqueous outflow is measured by applying the tonometer to the eye for four minutes and noting the resulting fall in intraocular pressure. The patient then sits awake in the darkroom for one hour and the facility of outflow is measured again. This second measure-

ment is carried out in a dimly-lit room. The comparison of these measurements will indicate whether or not there is any angle closure.

In the suspected glaucoma group the fall in outflow indicated by the test was 50 percent. This test was also used to determine the efficacy of treatment with miotics. (2 figures, 4 tables, 18 references)

Beulah Cushman.

Goldman, H. and Schmidt, T. **Friedenwald's coefficient of ocular rigidity.** *Ophthalmologica* 133:330-336, April-May, 1957.

The error of measurement in Friedenwald's method of estimating ocular rigidity from "paired" tonometric readings with different weights is so large that practically useful results cannot be expected. Ocular rigidity can, however, be calculated from two measurements of the intraocular pressure if one is made with the applanation tonometer and, therefore, practically uninfluenced by ocular rigidity, and if the other measurement is made with the 10 gram weight of the Schiøtz tonometer and therefore markedly influenced by ocular rigidity. Such measurements of ocular rigidity are essential for the correct evaluation of tonographic data and for the followup of glaucomas which, in most instances, is done and will have to be done, without the constant help of an applanation tonometer. Only if the ocular rigidity is known can one determine what constitutes the safe range of tonometric readings for a particular case of glaucoma.

Five cases of exceptionally low ocular rigidity in high myopes are reported, with their respective tonometric readings (with the 7.5 gm. weight) corresponding to an intraocular pressure of 24 mm. Hg (according to the 1955 scale). In two of the cases that reading was greater than nine tonometric scale units.

Most intraocular operations tend to

lower the ocular rigidity temporarily. This phenomenon must be taken into consideration in the evaluation of glaucoma operations.

Apparently high ocular tension with no loss of function proved to be due to exceptionally high ocular rigidity in a number of instances. (3 figures, 4 references)

Peter C. Kronfeld.

Hilton Rocha. **Table of tonographic coefficients.** *Rev. brasil. oftal.* 16:235-238, Sept., 1957.

The author has devised a table which gives the coefficients C, R and K of tonography directly with only the first and last reading of the electronic tonometer. (1 table)

Walter Mayer.

Hotta, T. **Evaluation of the bulbar compression test.** *Acta Soc. Ophth. Japan* 61:737-740, June, 1957.

Hotta claims that 1. during compression of the eyeball with a constant pressure, no obvious drop of ocular tension is demonstrable by a manometry, and 2. after the cessation of the compression, the ocular tension appears considerably lower than the original tension by tonometry; but it is not so low when measured by manometry. He considers that an eyeball compression test mainly causes a change in the rigidity of the ocular coat and, therefore, the apparent lowering of the tonometric tension of the eye after compression does not indicate the grade of the outflow facility of the aqueous humor. (2 tables, 12 references)

Yukihiko Mitsui.

Kantar, Bruce L. **Tonometry in glaucoma diagnosis by senior medical students.** *J. Lancet.* 77:191-192, June, 1957.

In a series of 453 outpatients an incidence of 2.4 percent of undiagnosed chronic simple glaucoma was found by senior medical students who included tonometry as a part of the physical examina-

tion in patients over 40 years of age. (4 references)
Irwin E. Gaynon.

Kuechle, H. J. and Rohrschneider, W. **Electroshock and ocular tension.** Arch. f. Ophth. 159:88-104, 1957.

The authors studied the effect of electroshock in 62 rabbits tonometrically. They found a marked decrease in tension in about 60 percent of their experimental animals, 27 percent showed no change and 14 percent showed an increase in tension. The authors feel that during electroshock peripheral spasms probably are of greater importance than the central phenomena. In a few studies with experimentally produced muscular paralysis, changes in tension became less noticeable. (4 figures, 4 tables, 45 references)

Ernst Schmerl.

Macri, F. J., Wanko, T., Grimes, P. A. and von Sallmann, L. **The elasticity of the eye.** A.M.A. Arch. Ophth. 58:513-519, Oct., 1957.

This article points out errors in the use of the usual formula for the calculation of aqueous humor flow. (7 figures, 3 references)

G. S. Tyner.

10

CRYSTALLINE LENS

Egleston, DuBose and Stocker, F. W. **The effect of epinephrine derivatives in preventing anterior chamber hemorrhage following cataract extraction.** North Carolina M.J. 18:276-278, July, 1957.

In a series of 163 patients who had cataract extractions with corneoscleral sutures, one half of the patients received postoperative Adrenosem for seven days, and the rest were used as controls. Of the patients without Adrenosem 14 had hyphemas. There were ten cases of hyphema in patients receiving Adrenosem. (2 tables, 8 references)

Irwin E. Gaynon.

François, J., Rabaey, M. and Evens, L. **Histopathologic examination of an eye with a Ridley lens implant.** Ann. d'ocul. 189:923-931, Nov., 1956.

The authors report four cataract operations with inclusion of a plastic lens. Only one truly satisfactory result was obtained. All cases showed an intense postoperative iritis. One patient developed a severe glaucoma, a second a bullous corneal edema and the third an eventual absolute glaucoma leading to enucleation. Histopathologic examination showed an intense exudative reaction due to intolerance to the acrylic lens. (5 figures, 11 references)

David Shoch.

Greetham, J. S. and Makley, T. A., Jr. **Intraocular fungus infection following cataract extraction.** A.M.A. Arch. Ophth. 58:558-561, Oct., 1957.

The authors report a case of a fungus infection of the eye, coming on one month after surgery. In spite of intensive treatment, the eye required enucleation. (2 figures, 6 references)

G. S. Tyner.

Hagedoorn, A. **Transient cyst formation in the anterior capsule of the lens.** Brit. J. Ophth. 41:442-443, July, 1957.

A 43-year-old man noted blurred vision and halos around lights. Slitlamp examination revealed a tiny central cyst of the anterior capsule of the lens. Subsequent examination four years later showed it to have disappeared entirely. (3 figures, 2 references)

Morris Kaplan.

Kwaskowski, Adam. **A case of postoperative complications after cataract extraction.** Klinika Oczna 27:175-179, 1957.

An unusual complication after uneventful intracapsular cataract extraction in a 66-year-old woman is described. For ten days recovery was normal. On the eleventh day the anterior chamber became flat, the eye became congested, folds appeared on Descemet's membrane and the iris became congested. Ophthalmoscopic

examination showed a normal posterior segment of the retina and definite edema with exudate of the whole peripheral segment including the ora serrata. Under local treatment with scopolamine and the prescription of vitamin C and B, pyramidon and bromides, the inflammation subsided within one month. The final result was good; visual acuity with glasses was 5/5. (1 figure, 14 references)

Sylvan Brandon.

Mizukawa, T., Takagi, Y. and Hama, H. **Inhibitory action of glucuronic acid upon the development of naphthalene cataract.** *Acta Soc. Ophth. Japan* 61:712-718, June, 1957.

Sodium glucuronate, when given to rabbits subcutaneously at the rate of 25 mg. per kg. body weight every day, inhibits the development of naphthalene cataract in experimental animals. This agent was proved to inactivate β -glucuronidase either in vivo or in vitro. The authors suppose that the agent inhibits a production of cataractogenic substance from naphthalene in the system by changing the metabolic pathway of the latter. (11 figures, 1 table, 23 references)

Yukihiko Mitsui.

Rusin, A. and Mrozinski, B. **Protective dressing after cataract extraction incorporating corrective lens.** *Klinika Oczna* 27:187-189, 1957.

To decrease anxiety in patients after surgery for cataract, the author uses a protective shield which has a small 8 to 10 mm. +10D. lens incorporated in its center. The patient is reassured as to the result of the operation and is relaxed. The lens is tinted to prevent photophobia. (2 figures)

Sylvan Brandon.

11

RETINA AND VITREOUS

Appelmans, M. and Michiels, J. **Lesions of the retina and optic nerve in the new-**

born. *Bull. et mém. Soc. franç. d'opht.* 69:423-436, May, 1956.

The neuroretinal dysplasia of the newborn represents a poorly defined and vaguely understood clinical entity. Four case histories are discussed in detail with the purpose of clarifying the pathogenesis. Retinal and cerebral disturbances in circulation during the last months of pregnancy, during delivery or during the first months of life are believed to be the main cause for the retinal gliosis and fibrosis and the simultaneous cerebral disturbance rather than dysgenetic factors in numerous cases. Ophthalmoscopic examinations under mydriasis and general anesthesia eliminated the presence of retinal tumors. The differential diagnostic possibilities of frequent E.R.G. were recognized. (1 table, 4 figures, 23 references)

Alice R. Deutsch.

de Barros, M. and Lustosa, S. **Diabetes and hypertension.** *Rev. brasil. oftal.* 16:177-182, June, 1957.

The authors call attention to the fact that diabetic retinopathy and hypertensive retinopathy are two different entities, even though diabetes and hypertension are often associated. They found that the retinopathy which had as its characteristic signs new-formed capillaries at the disc or at the arterio-venous crossings, dilatation, tortuosity, corkscrew appearance and crystalline sheathing of the veins, was present in very serious cases of diabetes, with poor prognosis for life and vision. When hypertension was an important factor in the diabetic patient there were many more arteriolar changes rather than venous. (13 references)

Walter Mayer.

Bernardczykowa, A. and Baron, J. **Significance of eyeground changes in the differentiation of primary and secondary forms of toxemias of pregnancy.** *Klinika Oczna* 27:133-142, 1957.

The authors report the results of examination of 170 women with late toxemia of pregnancy; 128 had primary toxemia, 33 had secondary toxemia and 9 had hypertensive and renal disease but no toxemia. Intraocular changes in primary toxemias are mainly functional, and in secondary toxemias mostly organic. Only exceptionally, in long-lasting primary toxemia, may one see organic changes. In secondary lesions organic changes were due mostly to previous kidney disease and only seldom to hypertension. Eyeground examination may be helpful in determining whether the toxemia is primary or secondary. (6 tables, 29 references)

Sylvan Brandon.

Charamis, J. **Treatment of retinal detachment in the presence of an intraocular foreign body.** Bull. et Mém. Soc. franç. d'opht. 69:465-469, May, 1956.

The bad prognosis of retinal detachment in the presence of an intraocular foreign body is generally recognized. The method suggested by the author consisted in precise localization of the retinal tear, diathermy coagulation around the tear, incising of the sclera in the center of the coagulation ring, exactly in the area of the tear, and extraction of the foreign body through the tear. In six cases of magnetic intraocular foreign body and in one case of nonmagnetic foreign body operation was successful. The method is only applicable in the presence of small movable foreign bodies and clear media; nevertheless it represents a very elegant maneuver, worth trying in appropriate cases.

Alice R. Deutsch.

Dias, D. **Retinoblastoma.** Rev. brasil. oftal. 16:285-305, Sept., 1957.

The author presents two cases of pathologically proven retinoblastoma among his own patients and reviews the literature on this subject. He emphasizes especially the treatment; he feels that with

the new radioisotopes the prognosis is much better than several years ago, particularly for bilateral lesions, where many times the second eye can be saved by nonsurgical treatment. The author emphasizes how important it is for general practitioners and pediatricians to refer immediately all patients with amaurotic cat's eye to an ophthalmologist. (30 references)

Walter Mayer.

Diaz Martinez, M. and Llopis Pallares, M. D. **A case of congenital retinal fold.** Arch. Soc. oftal. hispano-am. 17:255-258, March, 1957.

A case is reported in a 12-year-old girl whose left eye had a retinal fold which extended from the papilla to the posterior surface of the partially opaque lens. The malformation was accompanied by densely pigmented foci of choroiditis. The etiology of this anomaly is attributed by Ida Mann to an adhesion of the primary vitreous and its contents to the internal surface of the papilla, which the secondary vitreous could not rupture. The author believes that in this case the foci of choroiditis are indicative of an inflammatory origin of the anomaly. (1 figure)

Ray K. Daily.

Doggart, James H. **Classification and investigation of macular lesions in every day practice.** Lancet 273:201-204, Aug. 3, 1957.

The signs of macular disease may be classified under the following headings: 1. swelling can be fluid (central serous retinopathy), mainly solid, or mixed, 2. atrophy (macular hole), 3. vascular changes (hemorrhages), 4. new formed connective tissue (tears), 5. crystalline deposits, 6. Alterations in the foveal reflex (unilateral partial optic atrophy) and 7. discoloration (old macular edema). (6 tables, 27 references)

Irwin E. Gaynon.

Eliasoph, I. I. **A physiological reevaluation of the retinopathy of prematurity.** A.M.A. Arch. Ophth. 58:495-504, Oct., 1957.

This article fills a great need in attempting to explain the fundamental physiology of a premature that allows oxygen to produce the typical retinopathy. Many factors relating to blood vessels and metabolism are discussed. (3 figures, 34 references)

G. S. Tyner.

Shafer, Donald M. **The treatment of retinal detachment by vitreous implant.** Tr. Am. Acad. Ophth. 61:194-200, March-April, 1957.

Shafer discusses this new technique as employed in 72 consecutive implants. There were 29 successes. All eyes had had at least one and some five previous operations for retinal separation. Of interest in these studies has been the behavior of the vitreous itself. It appears to be completely inert and to be completely acceptable to the recipient eye which shows no more reaction than occurs after an extensive diathermy. The implants whiten quickly and cause little pain or discomfort. Reading of the complete article is recommended. (2 tables, 7 references)

Theodore M. Shapira.

Smith, D. C., Kearns, T. P. and Sayre, G. P. **Preretinal and optic nerve-sheath hemorrhage: pathologic and experimental aspects in subarachnoid hemorrhage.** Tr. Am. Acad. Ophth. 61:201-211, March-April, 1957.

The authors experimentally produced preretinal hemorrhage into the optic nerve sheath of animals and agree with the present concept that there are separate and independent hemorrhages. They probably occur as a result of increased venous pressure secondary to sudden increased intracranial pressure. (12 figures, 19 references)

Theodore M. Shapira.

Waardenburg, P. J. **The question of the existence of neuro-epithelial dysgenesis of the retina in man.** Ophthalmologica 133:454-461, June, 1957.

Studying mouse strains with hereditary blindness, Keeler in 1927 found that the embryonic retina of these mice had not differentiated in a layer of rods and a layer of rod nuclei. Waardenburg now considers such a process of neuroepithelial dysgenesis as the cause of congenital hereditary blindness combined with keratoglobus in man. Of this combination he has observed a number of cases in Holland. The eyeground may be entirely normal or show the picture of tapetoretinal dystrophy.

Peter C. Kronfeld.

Wise, G. N. **Macular changes after venous obstruction.** A.M.A. Arch. Ophth. 58:544-557, Oct., 1957.

The author says that only rarely is the macula entirely normal after venous obstruction. The abnormal findings are pigment proliferation, pigment atrophy, residual macular edema, macular cyst, macular hole, persistent macular hemorrhages, neovascularization and aneurysms, and fibrosis and retinal folds. It is believed that these changes occur because the retina has a high rate of metabolism, and that the macula may suffer most from the decreased oxygenation. (12 figures, 37 references)

G. S. Tyner.

12

OPTIC NERVE AND CHIASM

Bischler, V. and Franceschetti, A. **Black and gray discolorations of the disc.** Bull. et mém. Soc. franç. d'opht. 69:408-422, May, 1956.

Localized small and some larger, single and multiple pigment spots on the disc have been described on various occasions. Total and partial melanosis of a disc of normal structure, margins and distribution of vessels was, however, seen only

rarely. The so-called black discs are considered to be a congenital anomaly. They mostly occur monocularly and do not cause impairment of vision. This partial or total melanosis of the disc should be distinguished from the benign melanoma which is characterized by a tumor-like appearance, usually encroaching on the papillary margins, and the malignant melanoma, characterized by a sudden growth and gradual or fast impairment of vision. Primary malignant tumors of the optic nerve are extremely rare and cannot be differentiated clinically from juxtapapillary choroidal melanosarcomas with invasion of the disc or an epipapillary melanosarcoma of the choroid covering the disc more or less completely without invasion of the nerve tissue itself.

The more frequent grayish discoloration of the disc is independent of pigmentation. It may be the result of a congenital lack of myelin (gray pseudoatrophy of the nerve head), a secondary loss of myelin or an optic effect of contrast. (6 figures, 116 references) Alice R. Deutsch.

Deller, M. and Streiff, E. B. **Retrobulbar neuritis and Q fever.** Bull. et mém. Soc. franç. d'opht. 69:309-314, May, 1956.

Q fever is caused by the *Coxiella burnetii*, the smallest and only filtrable rickettsia. Contamination occurs by inhalation while other rickettsial diseases require direct inoculation. The *Coxiella burnetii* is characterized by its neurotropism. The case of a 41-year-old man is reported who, during a severe attack of Q fever, also had a retrobulbar neuritis. There were no other neurologic complications. Normal vision and field were preserved in the left eye but the right optic nerve became pale and the vision was impaired. Ocular complications such as temporary rigidity of the pupils, diplopia and episcleritis have been described during attacks of Q fever. The absence of known fundus changes could be ascribed to the rareness of oph-

thalmoscopic examinations during this disease. The importance of ophthalmoscopic examinations during systemic diseases of various origin is emphasized. (14 references) Alice R. Deutsch.

Lansche, R. K. and Rucker, C. W. **Progression of defects in visual fields produced by hyaline bodies in optic discs.** A.M.A. Arch. Ophth. 58:115-121, July, 1957.

Fourteen cases are reported in which defects of the visual field were studied over a period of years. Six patients showed a progression of field defects and eight showed no change. These changes occurred without a change in the ophthalmoscopic appearance. The principal sign was development or progression of arcuate defects. (7 figures, 4 references)

G. S. Tyner.

Nano, H., Scenna, M. and Baron, H. **Blurred discs and pale discs.** Ann. d'ocul. 189:932-938, Nov., 1956.

In addition to a slight loss in vision and an enlarged blind spot the authors feel that a blurring of the disc can be evaluated by an effacement of the physiologic cup, a hypermia of the disc and a curvature of the arteries and veins at the disc margin. The pale disc is then discussed and its characteristics given. The authors conclude by outlining a plan of investigation of patients with abnormally pale discs.

David Shoch.

Viallefort, Bondet and Jaulmes. **Abnormalities of the optic nerve in the course of leukemias.** Bull. et mém. Soc. franç. d'opht. 69:328-332, May, 1956.

Systematic studies of the disc in leukemias have been made only occasionally; however blurring, edema and pallor of the disc, sometimes with rapid impairment of vision, have been described during various stages of these diseases. Among 90 patients with leukemia the

authors found 29 with abnormalities of the disc. There was no apparent relationship between the fundus picture and deviations of blood cells, modifications of blood chemistry or the components of the bone marrow.
Alice R. Deutsch.

13

NEURO-OPHTHALMOLOGY

Bender, M. B., Postel, D. M. and Krieger, H. P. **Disorders of oculomotor function in lesions of the occipital lobe.** *J. Neurol., Neurosurg. & Psychiat.* 20:139-143, May, 1957.

The authors point out that the association of the occipital cortex with vision is well known but motor disturbances of the eyes are rarely attributed to a disturbance in this region of the cerebral cortex. They report two cases of oculomotor abnormality associated with a lesion of the occipital cortex; in one the cortical disturbance was bilateral and in the other unilateral. The concept of an occipital oculomotor field is reviewed. Although a complete physiologic explanation cannot be given it seems clear that the occipital cortex does play a part in oculomotor control. (3 figures, 17 references)

Irwin E. Gaynon.

Bengis, N. and Alaton, I. **A case of hemianopsia of doubtful etiology.** *Ann. d'ocul.* 190:500-507, July, 1957.

Four days after a lobectomy a patient complained of loss of vision. She had been unconscious for the entire four postoperative days. Examination revealed that vision was reduced to finger counting and the fields were markedly constricted. Central vision gradually improved and in six months was 10/10 in each eye, however the field was limited to the right superior quadrant in each eye. All tests were negative and the authors are unable to explain the loss of three-fourths of the visual field in each eye with retention of good

central vision. They feel that one must admit the existence of a bilateral hemianopsia complete on one side and incomplete on the other. The most likely etiology is a prolonged anoxia due to narcosis. (5 figures, 6 references)
David Shoch.

Dubois-Poulsen, A. G. and Magis, C. **Ligature of the anterior choroidal artery.** *Bull. et mém. Soc. franç d'opht.* 69:451-461, May, 1956.

The anterior choroidal artery supplies parts of the hippocampus, the optic tract, external geniculate body and optic radiations as well as the basal ganglia, the globus pallidus and thalamus, and the posterior division and retrolenticular part of the internal capsule, to end in the choroidal plexus of the lateral ventricle; especially in the area of the terminal segment, branches of the posterior cerebral artery supply the collateral vascularization. Vascular accidents in this region have been widely investigated. Signs and symptoms, namely hemiplegia, hemianesthesia and homonymous, congruous hemianopsia with sparing of the macula are summarized as the syndrome of the anterior choroidal artery. In spite of this close relationship to the optic pathways, ligation of the anterior choroidal artery for alleviation of extrapyramidal contractions or Parkinsonian tremors only rarely has caused visual disturbances. The case history of a 52-year-old man with Parkinson's disease is reviewed. Ligature of the left anterior choroidal artery resulted in a complete congruent right hemianopsia, and also in transient confusion and language difficulties. The topographic anatomy of the vascular system of the region of the brain is reviewed. For better understanding the course of the anterior choroidal artery is divided into four segments. The appearance and pathogenesis of the lesions of each segment are discussed. The significance of perimetric studies in the presence of such lesions is considered

of essential importance not only for diagnostic purposes but also for a better interpretation of minute defects in the fields and in their relationship to pathologic changes in the area of the optic radiation. (2 figures, 45 references)

Alice R. Deutsch.

Gass, H. Harvey. **Papilledema and pseudotumor cerebri following poliomyelitis.** A.M.A. J. Dis. Child. 93:640-646, June, 1957.

Papilledema occurs only rarely during convalescence after poliomyelitis and is not widely recognized as one of the late complications. The author reports two cases, each of which occurred in a child. The result of subtemporal decompression was gratifying in each. (1 figure, 12 references)

Irwin E. Gaynon.

Lopez-Porrúa and Pinero Carrion. **Foster-Kennedy syndrome not caused by a tumor.** Arch. Soc. oftal. hispano-am. 17:269-278, March, 1957.

This is a comprehensive review of the literature with special emphasis on etiology other than tumors, and a report of a case (the sixteenth to be reported) caused by optochiasmatic arachnoiditis. The patient, 39 years old, had an atrophy of the right optic nerve, and papilledema of the left; visual acuity was 1/50 in the right eye and normal in the left. The radiographic and cisternographic studies led to a diagnosis of optochiasmatic arachnoiditis. The patient was operated upon and, in addition to the optochiasmatic arachnoiditis, an anterior baso-cranial dysplasia was found. The inflammatory adhesions were separated and the histologic preparations of the removed tissue showed a chronic inflammatory process. Within two months the patient's vision improved to normal; both optic discs presented a picture of postneuritic atrophy. The improvement in the visual acuity of the right eye in spite of the optic atrophy

was very striking. (6 figures, 32 references)

Ray K. Daily.

Smith, J. L. and Walsh, F. B. **Syndrome of external ophthalmoplegia, ataxia, and areflexia (Fisher).** A.M.A. Arch. Ophth. 58:109-114, July, 1957.

Two cases of Guillain-Barré syndrome are reported with emphasis on the ocular findings. The authors summarize the ocular findings in these and three cases reported by Fisher. All cases occurred in men from 38 to 63 years of age; usually there was total external ophthalmoplegia but downward gaze may be spared and there was associated seventh nerve palsy. These signs were combined with profound general neurologic signs of cerebellar ataxia and areflexia. There was spontaneous recovery in seven to 12 weeks without treatment. (6 references)

G. S. Tyner.

14

EYEBALL, ORBIT, SINUSES

Farina, R., Renata Attadia, E. and Dias, J. **Deformity of the supraorbital arch through loss of bony substance.** Arq. brasil. de oftal. 19:299-307, 1956.

Deformities of the supraorbital arch vary in severity with the amount of bone that is lost. The globe is rarely affected in the pathologic process which may be traumatic, infectious or neoplastic in nature. After a brief review of the anatomy of the orbit, the author describes the basic principles in his technique for correcting the defect. Careful asepsis and hemostasis are essential. An autogenous bone graft is preferred, using either the ilium or rib. Osteoperiosteal grafts are preferable, as the periosteum favors integration of the graft. Nonoxidizing sutures or simple cotton sutures are recommended, and the interposition of large particles between the graft and receptor bed is to be avoided. Once the graft is shaped and placed in po-

sition, the incision is closed with cotton suture. The wound heals in approximately 10 days. (5 figures, 10 references)

James W. Brennan.

François, J., Ectors, L. and Verriest, G. **Cholesteatoma of the orbit.** *Ophthalmologica* 133:175-187, March, 1957.

The only clinical symptom in the case reported (a 39-year-old man) was gradual displacement of the right eyeball forward and downward, without loss of motor or sensory function. X-ray studies revealed flattening and lateral displacement of the lateral portion of the orbital roof plus a sharply outlined area of destruction which seemed to be located in the frontal bone. The clinical impression was fronto-orbital meningioma. Surgical exploration by the transfrontal route showed the bony defect to be in the greater wing of the sphenoid. Through this defect the extradural spaces communicated with the orbit. A well encapsulated tumor of walnut size was identified in the upper, outer and posterior portion of the orbit, with extensive adhesions to the periosteum. Capsule and contents of the tumor were removed separately. The patient made an uneventful recovery. The histologic diagnosis was cholesteatoma-granuloma without epithelial elements.

The approximately 50 cases of orbital cholesteatoma reported in the literature are reviewed and classified according to 1. origin, congenital or acquired, and 2. the cell content and specifically the amount of epithelial elements.

Despite the fairly characteristic location and X-ray picture the differentiation of cholesteatomas from other orbital tumors may be difficult. (4 figures, 3 tables, 35 references)

Peter C. Kronfeld.

Litricin and Jovicevic, B. **Eosinophilic pseudotumor of the orbit.** *Bull. et mém. Soc. franç. d'opht.* 69:225-238, May, 1956.

The eosinophilic granuloma of the orbit

is considered to be rare. The following specific signs and symptoms differentiate it from other intraorbital tumors. It mostly affects young children. A pronounced but changeable swelling of the upper lids, severe localized pain, exophthalmos and osteolytic changes of the orbital roof suggest the diagnosis, especially if accompanied by an eosinophilia of the blood and bone marrow. On surgical exploration the tumor is only rarely found to be encapsulated, on the contrary, it mostly infiltrates the orbital structures diffusely. The pathologic specimen shows large histiocytes with vacuoles and phagocytosed debris, eosinophiles and plasmocytes. Histiocytes and eosinophiles are grouped especially around the blood vessels. The eosinophilic granuloma is considered to be one of the expressions of a generalized reticulosis. Blood and bone marrow eosinophilia remain unchanged for months even after regression of the local lesions. This was also the experience of the authors; their two patients did recover clinically, but still had the typical blood and bone marrow changes three to four months after local recovery. As for the etiology of the eosinophilic granuloma, all attempts to ascribe it to any kind of bacterial or viral infection have been unsuccessful. (5 figures, 49 references)

Alice R. Deutsch.

Segal, P., Freytag, T. and Sokolowski, S. **Use of fast-polymerizing acrylic in surgery of the orbit.** *Klinika Oczna* 27:143-156, 1957.

The authors present the results of 11 attempts to implant plastic material in 10 patients with bony defects of the orbital margin due to injury or osteomyelitis. The plastic used was fast-polymerizing acrylic. Operations were performed either through the skin or the mucous membrane of the mouth. Acrylic was well tolerated; tissue reaction depended on the size of the implant. Two patients needed removal of

implants because fistula developed. It became apparent that if good periosteal covering could be secured the result was good. In both unsuccessful cases there was insufficient periosteum to cover the implant. Depending on location and extent of the bony defect, the cooperation of a neuro- or maxillo-facial surgeon should be secured. (19 figures, 2 tables, 4 references)
Sylvan Brandon.

Zankiewicz, Alla. **A case of injury of the orbit by a piece of wood.** *Klinika Oczna* 27:181-185, 1957.

A case of penetrating injury into the orbit by a piece of wood is described in a boy, nine years of age. The wound, 2 cm. long, was in the nasal corner of both lids. Inspection, probing and X-ray examination did not reveal any foreign body in the wound. Symptoms persisted and two additional operations were performed in which 11 particles of wood which were found in the area of the orbital fissure were removed. Symptoms receded leaving only slight limitation of motion and optic atrophy. (2 figures, 9 references)

Sylvan Brandon.

15

EYELIDS, LACRIMAL APPARATUS

Herouet, F. and Tessier, P. **A new ptosis operation.** *Bull. et mém. Soc. franç. d'opht.* 69:238-242, May, 1956.

The technique described in this paper attacks the three basic causes of ptosis simultaneously. After application of two fixation sutures, one close to the ciliary margin and the other through the conjunctiva of the everted upper lid, a deep curved incision is made along the ciliary border from the external to the internal canthus. The ends of this incision are united by an equally deep incision along the upper edge of the tarsus. Three evenly spaced double-armed sutures approximate the levator and conjunctiva to the

ciliary end of the tarsus. The redundant skin and excessive orbicularis fibers are excised and the skin wound is closed with seven or eight interrupted sutures. The skin sutures as well as the deep sutures should be removed after eight days. The surgical results are good. A mild overcorrection with some lagophthalmos was observed only in cases with tight upper lids and epicanthus. The combined technique of strengthening the underacting and of weakening the overacting antagonist makes this method available for various types of ptosis. The simplicity of the procedures makes this operation especially acceptable. (4 figures)

Alice R. Deutsch.

Lucas, J. and Pasqualucci, M. **Palpebral localization of molluscum contagiosum.** *Rev. brasil. oftal.* 16:241-247, Sept., 1957.

The authors present a brief history of the literature on molluscum contagiosum and present a case, the first one among 14,000 patients. The lesion was extirpated and the microscopic examination revealed molluscum contagiosum. The patient was treated with aureomycin topically after surgery. (2 figures, 23 references)

Walter Mayer.

Semeraro, E. **The so-called senile ectropion.** *Rev. brasil. oftal.* 16:69-76, March, 1957.

The author believes that the term senile ectropion, as commonly used, is wrong, as the disease is not a complete outward eversion of the lid, but rather a separation of the skin of the lid from the orbicularis muscle, due to the interposition of some foreign material. He suggests that the disease be called "deforming blepharitis." This view is based on pathologic studies done on these lids. Therapeutically all that is needed is the excision of this new-formed tissue and the so called ectropion will be cured. (10 figures)

Walter Mayer.

Urist, M. J. **Bilateral blepharospasm.** A.M.A. Arch. Ophth. 58:520-529, Oct., 1957.

Eight cases of bilateral blepharospasm, most of them disabling, are reported. A new method of treatment, by placing a sling suture between the frontalis muscle and lid, has given symptomatic relief in three cases. (12 figures, 15 references)

G. S. Tyner.

Weizenblatt, Sprinza. **Nonspecific granuloma of lacrimal sac harboring polyethylene tube.** A.M.A. Arch. Ophth. 58:130-134, July, 1957.

A 79-year-old woman developed a non-specific granuloma in a stenosed lacrimal sac two years after the placing of a polyethylene tube. (4 figures, 8 references)

G. S. Tyner.

16

TUMORS

Brueckner, R. and Luedin, H. **Cytologic tumor diagnosis in biopsy material.** Ophthalmologica 133:169-175, March, 1957.

A case is reported in which the cell picture in an unintentional biopsy material clinched the diagnosis of malignant melanoma. In the 68-year-old female patient a detachment of the upper sector of the ciliary body and retina was first noticed two days after an uncomplicated intracapsular cataract extraction. The detachment increased in size and was, therefore, explored surgically. When several diathermy punctures with conventional needle electrodes failed to yield subretinal fluid a deeper puncture was made with a hypodermic needle and a small amount of fluid aspirated. The cytological examination of this fluid led to the diagnosis of malignant melanoma. A few days later the sclera in the region of the attempted detachment operation broke down with black tumor tissue protruding in the break. The eye was enucleated a few days

later. The histologic diagnosis was malignant melanoma of the ciliary body. The patient died of multiple metastases 22 months later.

The histologic characteristics of individual malignant tumor cells as encountered in tissue or tissue fluid samples obtained by biopsy puncture are reviewed. (4 figures, 14 references)

Peter C. Kronfeld.

De Mello, H. and Pereira, L. **Intraocular melanoblastomas.** Rev. brasil. oftal. 16:307-319, Sept., 1957.

The authors review the Brazilian literature on intraocular melanomas and make brief mention of some of the international literature on this subject. They present two cases of their own, one of a small melanoma of the choroid with detachment of the retina, in which a simple enucleation brought about a cure which has lasted for at least two years. Their second patient has a melanotic spot on the bulbar conjunctiva, a massive melanotic invasion of the anterior chamber and vitreous and a hard palpable mass in the abdomen. No surgery was performed on this patient, due to her liver metastasis, and therefore no pathologic confirmation of the diagnosis could be obtained. (3 figures, 35 references)

Walter Mayer.

Heinzen, H. **Relations between the eosinophile granuloma and the disease of Hand-Schueller-Christian.** Ophthalmologica 133:346-353, April-May, 1957.

In two small children a typical fatal Hand-Schueller-Christian disease was preceded by a stage of multiple bony defects containing granulation tissue in which the eosinophilic polymorphonuclear leucocytes were by far the predominating cell type. The lesson to be learned from these two cases is that eosinophile granuloma does not always carry a favorable prognosis. (6 figures, 30 references)

Peter C. Kronfeld.

Moacyr de Aguiar, P. and Maciera, A. **Primary epibulbar malignant melanoma.** *Rev. brasil. oftal.* 16:249-283, Sept., 1957.

The authors, having had two cases of primary malignant melanoma of the conjunctiva among 42,000 patients in the cancer institute, publish an exhaustive study on this subject because of the rarity of the lesion. They review the entire world literature on the subject. They describe their two cases in which they excised the

lesion and while frozen sections were being made, they enucleated the eye with a wide excision of the bulbar conjunctiva adjacent to the limbus. One of their patients disappeared two months after surgery and has not been heard of since; the other one is alive and apparently without metastasis nine months after the original surgery. (5 figures, 117 references)

Walter Mayer.

NEWS ITEMS

EDITED BY DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 19, Ohio

News items should reach the editor by the 10th of the month. For adequate publicity, notice of postgraduate courses and meetings should be received three months in advance.

NOTICE

TO OUR COLLEAGUES IN THE BRITISH STERLING AREAS

Apparently it is not widely known that a subscription to

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DEATHS

Dr. Carl Clarence Chase, Middletown, Connecticut, died September 17, 1957, aged 56 years.

Dr. Frank Conrad Keil, New York, died October 15, 1957, aged 73 years.

Dr. Ralph Alexander Poirier, Detroit, Michigan, died September 28, 1957, aged 40 years.

ANNOUNCEMENTS

MICHIGAN CONFERENCE

The University of Michigan Medical School announces its annual ophthalmology conference to be held April 21, 22, and 23, 1958.

The conference will be presented by Dr. F. Bruce Fralick and staff of the Department of Ophthalmology at the University Hospital. Guest speakers will be Dr. Max Chamlin, Dr. Paul A. Chandler, Dr. S. Rodman Irvine, Dr. Henry P. Wagener, and Dr. George N. Wise.

Applications may be addressed to the Department of Postgraduate Medicine University Hospital Ann Arbor, Michigan

OKLAHOMA CITY MEETING

The Oklahoma City Academy of Ophthalmology and Otolaryngology will hold its fifth annual spring meeting on March 6th and 7th. The meeting place is the main auditorium of the University of Oklahoma School of Medicine. The guest speaker in ophthalmology is: Dr. Joseph A. Haas, Chicago, and, in otolaryngology, Dr. Herman Semenov, Beverly Hills, California.

Further details can be obtained from:

Dr. E. N. Robertson, Jr.

301 N.W. 12th Street

Oklahoma City, Oklahoma

MASSACHUSETTS EYE AND EAR

At the annual meeting of the Massachusetts Eye and Ear Infirmary on Tuesday, April 15th, the Eye Service will present papers both morning and afternoon. The New England Ophthalmological Society will hold its regular meeting on Wednesday, April 16th. Prof. Ida Mann of Australia will be the visiting professor of ophthalmology for the meeting and will give the Howe Lecture on the afternoon of April 16th.

NEW ORLEANS ACADEMY

The midwinter convention of the New Orleans Academy of Ophthalmology, February 24th to 28th, will feature a symposium on uveitis. On the panel will be Dr. Wallace Epstein, Dr. Michael J. Hogan, Dr. Samuel Kimura, Dr. Irving H. Leopold, Dr. Floyd R. Skelton, Dr. M. Puig Solanes, Dr. Alan C. Woods, and Dr. Lorenz E. Zimmerman. The registration fee of \$75.00 includes associate membership in the academy for the year 1958, as well as all other features of the convention.

COURSE IN OPHTHALMIC PLASTIC SURGERY

A three-week intensive course in ophthalmic plastic surgery will be conducted in New York, April 7, 1958.

The course will consist of lectures, sessions in doctors' offices, preliminary and follow-up cases that are operated on during the time of the course, moving-picture demonstrations of various ophthalmic plastic procedures, observation and assistance at the operating table on actual surgical cases, cadaver work, and lectures and demonstrations; ancillary subjects, such as photography, pathology, X-ray and radiation, will be presented.

The course will be limited to eight students and will be given at the New York Eye and Ear Infirmary, Manhattan Eye, Ear, and Throat Hospital, and Hempstead General Hospital. The fee will be \$250.00.

Anyone interested should contact the registrar of the New York Eye and Ear Infirmary Post-Graduate School or:

Dr. Wendell L. Hughes, Hempstead, New York
Dr. Byron C. Smith, New York, New York
Dr. J. Gordon Cole, New York, New York

STANFORD SPRING POSTGRADUATE CONFERENCE

Stanford University School of Medicine will present the annual postgraduate conference in ophthalmology from Monday, March 31, through Friday, April 4th. Registration will be open to physicians who limit their practice to the treatment of diseases of the eye, or eye, ear, nose, and throat. In order to allow free discussion by members of the conference, registration will be limited to 30 physicians.

Instructors will be Dr. Dohrmann K. Pischel, Dr. Jerome W. Bettman, Dr. Max Fine, Dr. Earle H. McBain, and Dr. Arthur Jampolsky.

Programs and further information may be obtained from:

Office of the Dean
Stanford University School of Medicine
2398 Sacramento Street
San Francisco 15, California

FELLOWSHIP AND RESIDENCY AVAILABLE

A two-year fellowship emphasizing ophthalmic plastic surgery training and a residency are available. A New York state license is required. For further information write to:

Dr. Wendell L. Hughes
131 Fulton Avenue
Hempstead, Long Island, New York

SCHOLARSHIPS AVAILABLE

Applications are now being received for the scholarships of the Delta Gamma Foundation for the training of (1) orthoptic technicians, (2) teachers of partially seeing children, and (3) specialists for blind preschool children. The deadline for applications is May 1, 1958. For further information write to:

Delta Gamma Central Office
50 West Broad Street
Columbus 15, Ohio

TRAVEL FUND FOR INTERNATIONAL CONGRESS

The National Institute of Neurological Diseases and Blindness has announced the establishment of a special travel fund designed to aid younger ophthalmologists and other scientists engaged in ophthalmologic teaching or research to attend the XVIII International Ophthalmology Congress. The congress is being held in Brussels, Belgium, September 8 to 12, 1958.

The fund was made possible by a grant from the National Advisory Neurological Diseases and Blindness Council to a council subcommittee. In authorizing the grant, the council noted that "an International Congress offers enormous value in the training and exchange of ideas" among scientific investigators.

The subcommittee has asked that all applications for aid from the fund be made in letter form and addressed to Dr. Gordon H. Seger, Chief, Extramural Programs, National Institute of Neurological Diseases and Blindness, Bethesda, Maryland. The letter of application should also provide a brief review of the applicant's educational and occupational background and should indicate his major field of interest.

The deadline for receipt of applications is March 1, 1958. The council subcommittee will make its selections and notify those to be aided by letter no later than April 1, 1958.

NEW YORK PARTICIPATING CONFERENCE

The annual participating conference of the New York Society for Clinical Ophthalmology will be held at the Waldorf-Astoria Hotel on Friday, March 28th, and Saturday, March 29th. The registration fee, which includes luncheons, is \$50.00. Those interested should contact the registrar:

Miss Gloria Benabo
737 Park Avenue
New York City

CUBAN COURSE REGISTRATION OPEN

The Foundation for the Teaching and Development of Ophthalmology announces that on January 10th registration opened for student doctors for the course for specialists in diseases of the eyes which will commence on June 2, 1958.

The course of studies will be in charge of Dr.

Tomas Yanes, with the collaboration of the professional members of the League Against Blindness. Classes in theory and practice will be held in the hospital of the institution. The training will take two years, in accordance with the program of the School of Ophthalmology.

The number of students for the first year is limited to 10, chosen from among young doctors of the Latin American countries who fulfill the following qualifications: (1) Possess the degree of doctor of medicine; (2) are less than 35 years of age and no more than five years from graduation; (3) of good moral character.

The fee for the course is \$500.00 Cuban pesos per year, \$250 a semester paid in advance. The students must provide the expenses of lodging and maintenance as well as transportation.

The institution will arrange for a stipend of \$1,500.00 (which covers all expenses, including those of living and teaching) for professional people of the Latin-American countries interested in these medical-teaching activities.

The foundation will make loans, to be paid back, provided that sufficient guarantees are given.

Applications should be received before March 31, 1958, and the candidates chosen should be in Havana on the first day of the course (June 2, 1958).

The joint faculty of the Association Against Blindness will select the candidates and their decision will be final.

MISCELLANEOUS

EASTERN RESEARCH SECTION

The 1958 meeting of the Eastern Section of the Association for Research in Ophthalmology was held at the National Institutes of Health, Bethesda, Maryland, January 17th and 18th. Immediately preceding the meeting on January 16th and 17th there was a symposium on "Electrophysiology of the visual system" under the chairmanship of Dr. M. Fuortes. The program follows: "Response pathways to electrical stimulation in the Limulus lateral eye," Leo E. Lipetz, Ph.D., Baltimore, Maryland; "Responses from the crayfish caudal photoreceptor," Donald Kennedy, Ph.D., Syracuse, New York; "Electrical responses from the isolated fish retina," Edward F. MacNichol, Jr., Ph.D., and Gunnar Svætichin, M.D., Venezuelan Institute for Neurology and Brain Research, Caracas, Venezuela; "Studies on the functional organization of the vertebrate retina," Henry G. Wagner, M.D., Bethesda, Maryland.

"Electrical activity of toad retina," Peter Gouras, M.D., Bethesda, Maryland; "Spectral sensitivity at the retina and at the optic tectum of the chicken," John C. Armington, Ph.D., and George H. Crampton, Ph.D., Washington, D.C.; "Physical factors in the correlation of ERG spectral sensitivity curves with visual pigments," Eberhard Dodt, M.D., Bad Nauheim, Germany; "Intraretinal recording with micropipette electrodes in the unopened cat eye," Kenneth T. Brown, Ph.D., and Torsten N. Wiesel, M.D., Baltimore, Maryland.

"Studies on the primary visual projection system in the cat," Wade H. Marshall, Ph.D., and Edward E. Evarts, M.D., Bethesda, Maryland; "Analytic studies of extraocular muscle discharge patterns," Goodwin Breinin, M.D., New York, New York; "Cortical unit responses to visual stimuli in non-anesthetized cats," David H. Hubel, M.D., Washington, D.C.; "Familial adaptometric and electroretinographic studies in retinitis pigmentosa," George Goodman, M.D., and Ralph Gunkel, O.D., Bethesda, Maryland.

MINNESOTA CONTINUATION COURSE

The University of Minnesota held a continuation course in ophthalmology for specialists at the Center for Continuation Study on the university campus during the week of January 6 to 10, 1958. Guest speakers were Dr. Harold Whaley Brown, New York University College of Medicine; Dr. Hermann M. Burian, Iowa City; and Dr. Harold G. Scheie, Philadelphia. The course was presented under the direction of Dr. Erling W. Hansen, head, Department of Ophthalmology. The remainder of the faculty included members of the faculty of the University of Minnesota Medical School and the Mayo Foundation.

SOCIETIES

NASSAU MEETING

At the November meeting of the Nassau (County) Ophthalmological Society, Dr. Raynold N. Berke presented a paper on "The surgical treatment of ptosis," and Dr. Emanuel Krinsky presented new instruments.

PERSONALS

Dr. James L. McGraw, Syracuse, has been appointed professor and chairman of the Department of Ophthalmology, State University College of Medicine in Syracuse, succeeding Dr. Franklin R. Webster.

Dr. Hedwig S. Kuhn was made an honorary member of the Australian Ophthalmological Society at the annual meeting of the society in Melbourne during October.

Dr. Alan C. Woods, professor emeritus of ophthalmology, The Johns Hopkins University School of Medicine, Baltimore, presented the XII Francis I. Proctor Lecture on Ophthalmology on Friday evening, December 6th, at the Morrison Auditorium, Golden Gate Park, San Francisco. The subject of Dr. Woods' address was "Disputed etiologies and entities in uveitis."

Dr. William M. Hart, chairman of the Department of Ophthalmology, Sibley Memorial Hospital, American University, Washington, D.C., addressed the Richmond Academy of Medicine on November 26th. The subject of his address was "Neoplastic metastases to the eye."

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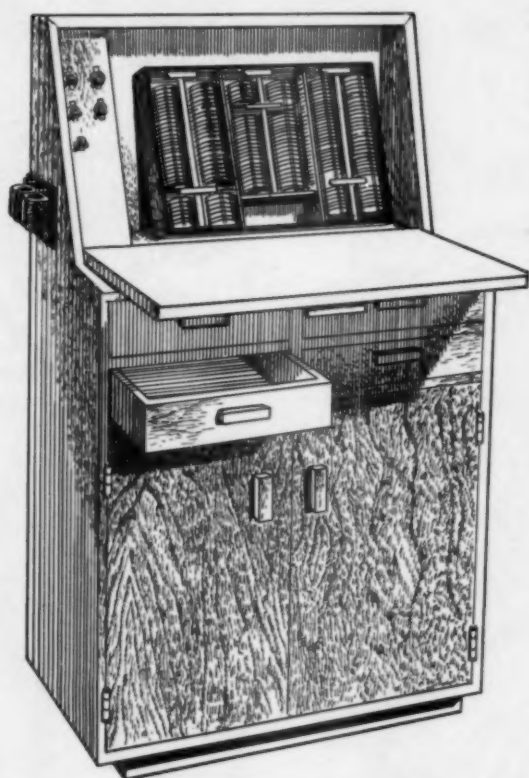
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